

Waterway and Wetland Handbook

CHAPTER 105

NONMETALLIC MINERAL MINING AND RECLAMATION

GUIDANCE PURPOSE AND DISCLAIMER

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A. PURPOSE

Nonmetallic mining projects in or adjacent to navigable waterways are generally large scale intrusions into the natural environment. Because such projects may severely impact public rights and interests in navigable waterways, NR 340, Wis. Adm. Code, was developed to establish criteria and standards to augment regulatory statutes and administrative rules.

B. MECHANISM

The principal mechanism for authorizing nonmetallic mining projects is a permit issued under ss. 30.19, 30.195 and/or 30.20, Wis. Stats. Other statutes that may come into play are ss. 1.11, 23.11, 66.038, 144.01 and 227.11. In addition to NR 340, other applicable administrative codes are NR 1.95, 102, 103, 115, 116, 117, 150, 269 and 504. Coordination with the Bureaus of Environmental Analysis and Review, Solid Waste Management, Water Resources Management, and Wastewater Management may be required. Operators may need to secure permits from the Bureaus of Solid Waste Management and Water Resources Management.

C. HISTORY

1. GENERAL

We are in the midst of what has been described as a minerals crisis, with domestic and world supplies falling short of demands. As a result, we can expect continued strong interest in mineral exploration and other mining activities in Wisconsin and throughout the Great Lakes region. A sharp increase in these activities in the past 10-15 years has already caused conflicts over competing land use values. Public concern is especially strong when mining activities occur near urban areas.

There are several thousand nonmetallic mineral mines in Wisconsin, many on or near water. Mines produce nonmetallic minerals such as sand, gravel, crushed stone, talc, clay, and peat.

Land used for mineral production in 1971 totaled 2,284 acres, or .006 percent of the total area of the state. Average productivity was \$36,793 per acre. A report produced by the Soil Conservation Service in 1977 indicates 85,516 acres, or about 0.25% of Wisconsin's surface area, has been disturbed by surface mining.

The sand and gravel industry dates from early settlement days when gravel was first used for surfacing roads. Statistical data on sand and gravel production since 1905 indicate cumulative production of over 1 billion tons. In 1970, there were 440 active sand and gravel operations in Wisconsin. Since 1958, sand and gravel has been the most valuable mineral commodity produced in the state. In 1971, Wisconsin ranked 7th among all states in sand and gravel production.

Stone is mined from various bedrock formations and processed as dimension or crushed stone. Dimension stone, which is used for building and ornamental purposes, must be visually appealing and durable. Crushed stone, which is used as aggregate in concrete and for other construction purposes, must be of proper chemical composition, strength, and durability. Ground limestone is used in agriculture as a soil treatment.

Extensive glacial activity left large deposits of sand and gravel in most Wisconsin counties. Deposits are principally in glacial outwash formations, either at the surface or buried beneath subsequent glacial debris. Drumlins, eskers, and river sediments may also contain valuable deposits of sand and gravel.

Clay deposits are scattered throughout many Wisconsin counties. Most contain lacustrine, estuarine, loess, residual and stream clays of glacial origin. The use of clay in the production of brick and tile was historically significant in the state, but has almost ceased. Clay is becoming increasingly important in landfill construction.

Talc is associated with Precambrian igneous and metamorphic rocks in Wood County. Talc was mined only in 1929 and 1930. The low grade of the material, small size of the deposits, and difficulty in removing impurities from the ore combined to make the activity unprofitable. With changes in market conditions or improvements in purification technologies, talc may become a valuable mineral resource in the state.

Wisconsin contains roughly 2.5 billion tons of peat on one million acres of land, the second largest peat reserve in the United States. Deposits of moss, reeds, sedge and humus peat were formed in swampy areas since the last glacial period and are distributed along the eastern one-half and northern one-third of the state. Peat was considered to be a low-quality source of fuel during the early 1900s. Use has since shifted toward agricultural and soil conditioning purposes.

Peat is the only Wisconsin product classified as a mineral fuel. Minor production of peat for fuel occurred in the early 1900s, and production for agricultural purposes began in 1941. Total production in 1970 was 1,581 tons; cumulative peat production in the state probably doesn't exceed 75,000 tons. Some peat is of very high value due to special processing, packaging, and use as a seed inoculant.

2. LEGAL

Prior to NR 340, major rivers were excavated and ponds were constructed adjacent to rivers with little attention to potential impacts to the functional values of the waters. Erosion and sediment control were practically unheard of. By the mid-1970s, problems associated with sand and gravel mining were apparent to Department staff and citizens' groups.

New guidelines were established after public concern focused on the Big Rib River, in Marathon County, where a large number of sand and gravel operations had caused extensive erosion and sedimentation over more than five decades. Then in the late 70s, with public awareness of the problem

already high, the Rush River, a trout stream in Pierce County, was flooded and damaged through a largely unregulated gravel mining operation.

At the prompting of Trout Unlimited, the Public Intervenor toured the sites in Marathon and Pierce Counties. Subsequently, his office petitioned the Natural Resources Board to develop rules for the regulation of sand and gravel mining. This petition outlined areas of concern and became the framework for the original and current code. The Department developed administrative code NR 340 at the direction of the Natural Resources Board.

NR 340 became effective on February 1, 1979 and was revised in September 1991 to correct organizational problems and include nonmetallic minerals listed in NR 340.02(9) (stone, sand, gravel or rock, asbestos, beryl, clay, feldspar, peat, talc and topsoil). NR 340 established the presumption that instream dredgings have negative impacts and places a burden of proof on the applicant to show otherwise. The applicant must also demonstrate that a feasible alternative is not available.

D. STANDARDS

1. STATUTORY STANDARDS

See handbook chapters on ss. 30.19, 30.195 and 30.20 for statutory standards.

2. ADMINISTRATIVE CODE STANDARDS

Following are brief descriptions of potentially applicable administrative codes other than those found in NR 340:

- a. NR 102 establishes administrative standards for classification of waterways and water quality standards.
- b. NR 103 establishes water quality standards to be applied by the Department in decisions affecting wetlands. NR 103 further specifies the requirements to be used by the Department when determining the potential adverse effects of a project on a wetland versus the benefit to the applicant.
- c. NR 115 establishes administrative standards to be followed by counties in their administration of shoreland zoning ordinances.
- d. NR 116 establishes administrative standards to be followed by local units of government in their administration of floodplain zoning ordinances.
- e. NR 117 establishes administrative standards for municipal regulation of wetlands.
- f. NR 150 establishes procedures for determining whether a given project requires an Environmental Impact Statement (EIS). Nonmetallic mining permits may require an environmental analysis; check the type list contained in the rule.
- g. NR 269 establishes effluent limitations for stone, gravel and the sand segment of mineral mining and processing.
- h. NR 504 establishes administrative standards for solid waste land disposal sites and facilities.

3. NR 340

- a. **NR 340.015 - Policy** - Natural Resources Board policy prohibits channel dredging and immediate bank excavations unless an operator can demonstrate that there are no reasonable alternatives [see

NR 340.02(16) and NR 340.06(6)]. Even if alternative sites are unavailable, an operator may not be able to modify the operation or reclamation plan sufficiently to demonstrate that channel dredging or bank excavation is technically, economically, and environmentally feasible. Facts must be presented to show that a project can be conducted in light of the environmental concerns identified in NR 340.015(1).

- b. **NR 340.035 - Exemption** - The exemption for application of the rule applies only to small operations if we determine there is little likelihood for adverse environmental effects. The known impacts of channel excavation projects would usually prohibit use of the exemption section even for small projects.

If a project qualifies for rule exemption, we still must authorize the project in accordance with the appropriate statutes. Any of the specific rule provisions may be applied to the project to ensure adequate control and environmental protection even when the project qualifies for an exemption.

- c. **NR 340.04 - Permit Application** - For connected enlargements and grading projects, applications must include the name and address of the secretary of any property owners' association pertaining to the bodies of water affected or, if there is no such association, at least 5 persons who own real property located adjacent to the bodies of water. If fewer than 5 persons own real property adjacent to the bodies of water, the names and addresses of such persons that own real estate so located shall be given.

Applications for a Ch. 30 permit must be submitted on forms provided by the Department (application form 3500-53 and nonmetallic mining application supplement). The applicant should also provide all of the following:

- 1) A description of the existing natural (vegetative cover) and physical conditions of the site; wetland and floodplain maps with the boundaries of the entire project clearly identified; and drawings and cross sections of the project site.

Information shown on drawings must be referenced to clearly identified, recoverable bench marks, described and located on the plans. If drawings are on paper larger than 8½ by 11 inches, we should require six sets.

The following points *must* be addressed:

- a) Soil and geologic composition of the project site (borings should be required during the early preplanning stages to identify the type of material and size of the deposit);
- b) Locations, dimensions and elevations of surface waters;
- c) The elevation of ground water throughout the nonmetallic mining site;
- d) Cross sections of the entire floodplain of any streams. A hydrologic and hydraulic analysis may also be required to demonstrate compliance with NR 116. Net changes in ground contours in the floodway of a stream that may cause an increase in the 100 year flood elevation, including temporary stockpiling, require a hydraulic analysis. Such changes may also require other action such as amending a flood profile or securing flooding easements to comply with ch. NR 116 or a local floodplain zoning ordinance;
- e) Location of manmade features on the site;
- f) Detailed plans and narrative descriptions of the nature and extent (dimensions) of any existing excavations, and the dimensions and quantities of stockpiled materials, topsoil and refuse on the site. The location of both temporary and permanent haulageways (roads) should be shown; including their length, width, side slopes, and elevations;
- g) Historical and archaeological features, if known;
- h) Existing drainage patterns; and
- i) Existing topography. Plans of the site should have a contour interval of 2 feet or less if

ground elevations will change and 5 feet or less if ground elevations will not change. A wider contour interval may be approved in areas of steep topography.

- 2) A legal description of all land within the project boundary that the applicant owns, leases or has an option to purchase or lease. Copies of deeds, options to purchase, and lease agreements must be submitted with the application.
- 3) An operation and reclamation plan as specified in NR 340.05
- 4) Evidence that the applicant has applied for or obtained all necessary local, state, and federal permits and licenses.
- 5) A statement explaining what the excavated material will be used for (e.g. road construction, asphalt, ready mix, cement blocks, cement pipe, etc.).
- 6) A description of any investigation conducted to identify alternative upland sites, and efforts made to obtain the material.
- 7) The estimated volume and quantity of material to be extracted, accompanied by adequate documentation for the basis of the estimates.
- 8) The Department may require other pertinent information in order to make a decision.

d. NR 340.05 - Operation and Reclamation Plans - The operator must provide an operation schedule describing the timetable for each sequential stage of a staged operation. The schedule should include yearly excavation plans over the life of the permit.

Unless reflected in the schedule, cessation of project operations for more than 180 consecutive days is an abandonment of operations [see NR 340.02(1)].

Each permit application must include detailed plans with drawings describing all of the following:

- 1) The location, extent (dimensions), depth and manner of operations anticipated for each stage of the operation including the proposed means of loading and transporting material and the estimated volume of material to be extracted. Adequate documentation for the basis of the estimates should be provided.
- 2) The final site configuration including depth, location and extent (size) of stockpiled materials and refuse disposal. The various types of material involved should be characterized.
- 3) The final reclamation plans must detail the manner, time frame and location of:
 - a) The removal, stockpiling, and protection (erosion control) of all materials in conformance with the local floodplain zoning ordinance and NR 116. Net changes in the ground contours of a stream's floodway, including temporary stockpiling, that may cause an increase in the 100-year flood elevation, will require a hydraulic analysis to be submitted by the operator if the operation exceeds 5 acres or has an estimated cost exceeding \$125,000. The analysis must demonstrate compliance or determine where flowage easements or floodplain zoning amendments may be required. Further action such as securing an amendment to a floodplain zoning ordinance and flood profiles or securing flooding easements may also be required of the operator before operations can get underway;
 - b) Measures to screen the operation from view considering the general shoreland zoning

requirements of NR 115.05(3)(c) and the need for buffer zones of sufficient width to prevent environmental pollution;

- c) Grading, and stabilization of the site;
- d) Measures for diversion and drainage of both ground and surface water from the site where necessary to protect surface and groundwater from pollution (include details about erosion control measures such as sediment basins, wash water ponds, sediment screens, silt fences, straw or rock check dams, grass waterways, etc.);
- e) Measures to be employed for erosion and drainage control of the site, and revegetation. Plans must outline both temporary and final stabilization measures. A diverse, self-regenerative species mixture should be used where consistent with final reclamation. A list of the species for both the seed mixtures and woody vegetation to be planted should be provided. Sources of information on stabilization, erosion control and seed mixtures include:
 - i) The Department of Natural Resource publication entitled *Wisconsin Construction Site Best Management Practice Handbook*, with listings for slope and soil type;
 - ii) The WI Department of Transportation *Standard Specifications for Road and Bridge Construction*, with minimum seeding requirements for disturbed earth and right-of-ways;
 - iii) Soil Conservation Service *Critical Area Planting Guidelines*, with listings for slope and soil types.

The operator may submit alternate seeding mixtures and stabilization techniques designed to achieve stabilization of the site if it can be shown that the methods of the agencies listed above are not appropriate for all conditions encountered.

Revegetation is not necessarily limited to planting of a grass cover; the Department may require woody vegetation (trees and shrubs) in the reclamation plan to offset habitat losses.

- 4) Estimated cost for progressive, temporary, and final reclamation of the entire nonmetallic mining site.
 - 5) An acknowledgement of continued responsibility for restoration and revegetation of the project site until stabilization has been determined to be adequate by the Department.
 - 6) Other information needed by the Department in order to make a decision.
 - 7) Estimated Reclamation Costs - The applicant must complete an estimate of all related reclamation costs as part of the application. The applicant may use the checklist of typical reclamation costs in the Nonmetallic Mining Application Supplement or provide information on a separate sheet. This information is needed for an environmental analysis and to determine whether the operator must submit a hydraulic analysis as specified in NR 116. These costs will be only a portion of the total project costs.
- e. **NR 340.055 - Bonding** - Bonding is required for each site over one acre and multiple sites of less than one acre by the same operator. Governmental units are not required to obtain bonds.

Where the material is used for Department of Transportation (DOT) highway projects, contractors

or permittees may ask DNR to sign off on the project in the fall so they can get paid by DOT for work completed. This is not acceptable because DOT bonds are required for different reasons than our bonds. A contractor should provide two bonds; one to fulfill DOT requirements and one for NR 340 reclamation requirements. According to our code, the reclamation bond may not be released until final site inspection not less than one year or more than two years after project reclamation.

- 1) Notification - The Department must determine the required bonding level for all operations and notify the operator. Following approval of the permit, and as a condition of the permit, the operator must file a bond with the Department. The bond amount shall be sufficient to cover the cost to the State of hiring a contractor to complete reclamation or progressive reclamation in staged operations.

Upon notification of required bonding levels by the Department, but prior to commencing the project, the operator shall file with the Department a bond conditioned on faithful performance of all requirements of Ch. 30, all provisions of NR 340 and all provisions of the permit. The operator may start operation and reclamation activities only after notification by Department staff that the bond submitted meets NR 340 requirements.

- 2) Bond Requirements - Bonds must be issued by a surety company licensed to do business in this state. At the option of the operator, a performance bond or a forfeiture bond may be filed. Surety companies may complete the reclamation plan in lieu of cash payment to the Department.

The bond shall provide that it is not cancelable by the surety, except after not less than 90 days notice to the Department in writing by registered or certified mail. The bond must be payable to the "State of Wisconsin, Department of Natural Resources." Not less than 30 days prior to the expiration of the 90-day notice of cancellation, the operator must deliver to the Department a replacement bond. If no replacement bond is provided the existing bond shall remain in effect.

When issuing a permit, use of the non-cancelable bond form shown in the appendix is recommended. This form prevents the permittee from canceling his bond until a replacement bond has been approved or the project has been closed out after a final inspection. This places the burden on the excavator to keep his bonds current.

The bonding level for reclamation or progressive reclamation in staged operations must be the larger amount of either \$2,000 per acre or \$0.25 per cubic yard of material excavated *based on 1989 dollars* unless the operator justifies a lesser amount to the Department's satisfaction.

The base of 1989 dollars requires that the bonding level must be adjusted to reflect inflation or the cost of living increases. For 1992, the inflation of 4.6 % for 1989, 6.1% for 1990 and 3.1% for 1991, or a total of 14% ($1.046 \times 1.061 \times 1.031 = 1.144$) must be added to the listed rates resulting in amounts of \$ 2280 per acre or \$ 0.285 per cubic yard. For permits issued after 1992, remember to correct for cost of living adjustments for all years back to 1989.

For per acre bonding, *all* areas needing reclamation must be considered, including haul roads, stockpile areas, crushing areas, etc.

Bonding for less than the amounts required by the code can only be granted if the operator adequately justifies a lesser amount. Although an operator can usually use his or her own equipment to reclaim the site "at-cost," the bond amount must be sufficient for the state to hire another contractor to provide all necessary services and materials. The bond amount, therefore, should be considerably higher than the operator's cost. One way an operator might justify a lesser bond amount would be to provide a firm proposal by an independent contractor

to complete reclamation. Such a proposal would have to clearly identify the scope of work and retain liability to ensure that reclamation will be acceptable to the Department at the time of final inspection.

Remember that the bond is on file with us solely in the event the permittee does not properly complete the project and environmental repair work must be completed.

- 3) Bond Alternatives - Upon written approval of the Department, an operator may deposit cash, certificates of deposit or government securities with the Department in lieu of a bond. Interest received on certificates of deposit or government securities must be paid to the operator. Certificates of deposit must be automatically renewable or other assurances must be provided before the maturity date. Any securities must be made payable to the "State of Wisconsin, Department of Natural Resources."
- 4) Bond Reevaluation - The amount for progressive reclamation bonds or security deposits may be reevaluated and adjusted either up or down when necessary. Areas that have been successfully reclaimed may be released from coverage. The procedure should follow NR 340.055(1)&(2).
- 5) Multiple Project Permit Bonding - Any operator who obtains a permit from the Department for two or more project sites may elect to post a single bond in lieu of separate bonds for each site at the time a second site is approved. Any single bond should be in an amount equal to the estimated cost to the state for reclamation of the sites. When an operator elects to post a single bond in lieu of separate bonds previously posted on individual sites, the separate bonds may not be released until the new bond has been accepted by the Department.
- 6) Calling Bonds, Etc. Due to Lack of Performance - The Secretary has not delegated authority to call bonds. This being the case, this action must be undertaken by the Secretary or a designee. The wording of the specific bond (or other guarantee) is crucial to how we proceed. Bonding companies and others who issue the guarantees will make sure the process follows the exact procedure specified in the guarantee. Program staff should work through the Bureau of Legal Services to start the process. They are the Department's specialists trained to understand and follow the varying procedures and to work with the financial companies involved. They are also legal counsel to the Secretary.

Calling a bond or other financial guarantee is a serious action taken when the permit holder is in violation of the permit and the law. Four options are available to the Department:

- Informally contact the bonding company or other grantor of financial guarantee. Explain that difficulties are being encountered and that formal intervention is being seriously considered. The financial guarantor may be able to influence the permittee to comply with the conditions of the permit;
- Initiate enforcement proceedings through a local court where both forfeiture and restoration can be pursued;
- Initiate an enforcement action to secure a forfeiture and appropriate action to call the bond or other financial guarantee;
- Initiate action to call the bond only.

The proper course of action depends on the seriousness of the violation and the urgency of securing compliance with permit requirements. Field staff, in consultation with central office staff and Department attorneys, should decide what action to take.

In order to prevent excessive delays, we recommend the following procedure:

- a) Documentation
 - i. Evidence should be submitted that the permittee has been unresponsive to repeated requests to comply with permit conditions or is financially incapable of complying.
 - ii. Cite the particular permit condition which the permittee has violated.
 - iii. Describe the environmental consequences of permit noncompliance.
 - b) Request: The request to call the bond or other financial guarantee and documentation should be submitted to the Bureau of Water Regulation and Zoning.
 - c) Transmit request: Water Regulation staff will review the request and draft a memo to LC for the director's signature requesting immediate action on the request.
 - d) Final action: LC should be able to take immediate action to call the bond or otherwise secure compliance.
- 7) Bond Release - The operator's bond must be released if we find, after inspection, that the operator has fully carried out and completed reclamation of the site in accordance with the operation and reclamation plans. The entire project site must be adequately revegetated and stable before we approve release of the bond. Final inspection must be made not less than one year, nor more than two years after the completion of the project, including reclamation. The completion date should be verified with the contractor once the site has been leveled, sloped, topsoiled, seeded and mulched.

If the site is not adequately stabilized at the time of final inspection, do not release the bond since its purpose has not been fulfilled.

Department staff should make annual reports based on site inspection. A report form for this purpose is included in the appendix. The applicant should also submit an annual narrative describing the progress of the operation and reclamation. Progress reports provide good documentation in support of bond release or in the event of non-compliance. All bonds and securities should be returned to the operator via certified mail with a return receipt requested.

- 8) Abandoned Sites - Bonds for any site abandoned at the time a permit expires may not be released unless it is shown that no operations have occurred at that site and no potential for environmental pollution exists as a result of an operator's actions or inactions.

f. NR 340.06(6) - Permits

(See section titled "Final Disposition" except for noticing requirements discussed below).

Notice Requirements - Within the three authority statutes applicable to nonmetallic mining, only connected enlargements or grading under s. 30.19 specifically require a public notice. However, due to the large scale of these projects and potential impact on navigable waterways, all applications for nonmetallic mining *may* be noticed in conformance with s. 30.02(2). The Department *may* issue a notice and/or hold a hearing on any project if the substantial interests of any party may be adversely affected by the proceeding. The party should be identified--either generically (e.g. public rights or interests) or specifically when known--and documented in the file. The notice is unnecessary when the Department elects to go to hearing.

When an operator requests renewal of a nonmetallic mining permit, a public notice and opportunity for hearing are required by rule regardless of the statutory authority [see NR 340.06(2)].

Standard notice wording should be used for public notices of nonmetallic mining proposals. For renewals, the notice should say, "... has applied to renew a permit to"

g. NR 340.08 - Permit Modifications

- 1) At any time prior to expiration of a permit, an operator may apply for an amendment or cancellation of a project permit or for a change in the reclamation plan for a site. The application for the amendment, cancellation or change should be submitted by the operator on a form provided by the Department. The application should identify the tract of land to be added to or removed from the permitted site, or to be affected by a change in the operation and reclamation plan. Any increase in the size of the site shall be subject to the notice and potential hearing requirement of s. 30.02. We may deny a permit modification application if the operator is in violation of the existing permit. It is important to properly document any permit modifications in a permit amendment.
- 2) When one operator succeeds to the interests of another in any uncompleted operation, the Department must release the first operator from the responsibilities imposed by s. 30.19, 30.195, or 30.20. and NR 340 *only if*:
 - a) both operators are in compliance with the requirements and standards of NR 340 and Ch. 30 permits;
 - b) the new operator assumes the responsibility of the former operator to complete the reclamation; and
 - c) the new operator submits an adequate bond.

h. NR 340.09 - Permit Extensions - A permit extension may only be granted one time and only toward the end of a project when permit renewals are no longer needed.

- 1) A request for a permit extension must be submitted to the Department in writing prior to the expiration date of the existing permit.
- 2) No permit extension may be granted unless the operation is in compliance with the terms of the existing permit.
- 3) Permit extensions may only be granted for projects which are expected to be completed within three years.
- 4) Permit extensions may be conditioned upon correction of any unanticipated environmental damage occurring during the original permit.
- 5) No public notice is required for permit extensions (see NR 340.09).

E. PERMIT PROCESS

1. JURISDICTIONAL DETERMINATION There are a couple of areas where extra care is warranted to determine whether a project is subject to our regulations.

- a. Ordinary High-water Mark** - Because of the generally large size and potential long term impact of nonmetallic mining projects, extra effort may be needed to determine regulatory jurisdiction. The Ordinary High-water Mark (OHWM) of a navigable waterway is the boundary we must

consider when determining jurisdiction. Most nonmetallic mining projects are in or near streams, where the OHWM can be hundreds of feet landward of the normal water's edge. For this reason, additional time should be planned to locate our jurisdictional limit.

b. Grading the Bank of a Navigable Waterway (s. 30.19) - The definition of bank in NR 340 provides a great deal of latitude for establishing jurisdiction. These three points are key:

- 1) First, s. 30.19 applies if the area adjacent to a navigable waterway "slopes or drains without complete interruption into the waterway" either before or after grading or excavation.
- 2) Second, s. 30.19 applies if the natural ground is not excavated but is filled and graded so the area slopes without interruption into the waterway.
- 3) The statute does not limit the lateral extent that a slope may run from the waterway. However, one must consider the practical application of the statute. Section 30.19 was developed to protect the adjacent waterway. If the closest point of a grading project is sufficiently far from an adjacent waterway that one would not reasonably expect the waterway to suffer any detrimental consequences, it may not be prudent to assert jurisdiction. This limit will vary depending on the particular circumstances of a project. It might be as far as a quarter of a mile, though more often it would be closer to 500 feet. One must use discretion in evaluating the potential impacts.

c. Agricultural exemption under s. 30.19 - Landowners and potential operators occasionally attempt to shield nonmetallic mining from regulation by claiming agricultural use. Several factors should be considered to determine whether this claim is legitimate:

- 1) Does the final use of the area after excavation *directly* relate to an acceptable agricultural practice (e.g. a stock watering pond, or grading and excavation to allow construction or expansion of agricultural buildings)?
- 2) Is the contemplated use reasonable? These examples describe the kind of evaluation used to determine reasonable use.
 - a) Example 1 - A quarter-acre pond may be adequate for watering several dozen cattle. However, a 5- to 10-acre pond with a pier or swimming raft, dug deep enough to support rainbow trout for fishing, should probably be considered beyond the bounds of what is needed to qualify for the agricultural exemption.
 - b) Example 2 - A farmer wants an irrigation pond to provide water for 40 acres at a rate of 1" per week. He will need 3.33 acre feet of water. This can be obtained with a 3.33-acre pond 1 foot deep, a 1.67-acre pond 2 feet deep, a 1.1-acre pond 3 feet deep, etc. To accommodate the rise and fall of the groundwater table, a reasonable, adequate irrigation pond might be 6 to 8 feet deep. Such a pond probably would require no more than 0.5 acre.

2. PREAPPLICATION PLANNING

The pre-application planning process is extremely valuable. As a first step, a meeting should be scheduled at the site with the operator. Several points should be addressed at this time, including Department jurisdiction, permit application needs, and statutory or administrative code standards and prohibitions. At this time, we should also identify sensitive areas within the project site, possible "fatal flaws" within the project plan, and potential hurdles or problems anticipated at this very early stage.

This is an excellent opportunity to provide the operator with the *Operator's Guide to Nonmetallic*

Mining (included in the appendix). The guide contains all information needed by an operator to submit an acceptable application.

Discussions during the pre-planning stage should be documented with follow-up letters.

It should be made explicitly clear that Department staff cannot assure project approval even though the applicant may address all concerns raised during the preapplication meeting. Project approval requires many steps, including complete and acceptable application materials, evaluations by other DNR staff, and possible public hearings.

Points to Consider and Discuss at the Preapplication Meeting

- a. The Department is responsible for the public trust concerns in the state's navigable waters. The protection of a waterway is not based solely on the recreational use it has, but is based on the values of the individual waterway and related resources within a system.
- b. The analysis of natural environments at proposed excavation sites is a critical part of the preapplication stage. Data on size, depth and type of deposits, surface water, groundwater, vegetation, wetlands, floodplain, wildlife and significant land features must accompany permit applications.
- c. Since nonmetallic mining in and adjacent to waterways can permanently alter fish and wildlife habitat, the site analysis required of the operator should provide specific information about existing fish and wildlife habitat conditions. The analysis should include the species of birds, land animals, and aquatic wildlife known to use a proposed excavation site. It may be wise to coordinate the preapplication meeting with the local fish and wildlife managers.
- d. The application must address what precautions will be taken to avoid negative impacts to the existing habitat and describe a plan to provide desirable habitat through reclamation. The following guidelines may be useful in developing these components of the application.
 - 1) The use of woodlands should generally be avoided when sufficient quantities of material can be obtained in less densely vegetated upland areas. When woodlands cannot be avoided, the excavation site might be located in large cover type of homogeneous woodlands. The excavation site could eventually create a wildlife opening if properly reclaimed and vegetated.
 - 2) The ecological importance of terrestrial habitat in floodplains and wetlands is well documented. Alterations to these areas should be avoided, if possible.
 - 3) Riparian zone habitats in floodplains have high primary and secondary productivity for a variety of flora and fauna. These zones develop dense thickets of shrubs, willow and alder, which are intermixed with diverse stands of deciduous and coniferous trees. They are highly productive areas for feeding, nesting, and cover for local fauna. Habitat loss and alteration can significantly lower animal populations.
 - 4) Dry excavation sites located in floodplains generally disturb a greater amount of habitat than wet excavations.
 - 5) Surface mining can add to habitat diversity by varying slopes, elevations and configuration of graded areas during the final grading and reclamation. Plant species should be suitable for final land form variations. Use of annuals, perennial grasses, legumes and woody perennial shrubs and trees should be discussed. Vary vegetation to support diverse populations of insects and birds which feed on them. On excavation sites

surrounded by forests, reclamation to grasses, legumes, shrubs and grain crops will benefit deer, rabbits, and grouse.

- 6) Design is as important to a good reclamation plan as plant species. The key to good wildlife management is to intersperse annuals, perennial grasses, and legumes with shrubs, woody perennials, and/or conifer trees. Many small irregularly shaped plantings provide more cover and diversity than a few large areas.
- 7) Once established, annual mowing of perennial grasses and legumes will help maintain the wildlife habitat. Mowing should be delayed until after ground nesting birds are through nesting. Periodic fertilization of the site may be needed to maintain a quality plant cover both for wildlife and erosion control. If the revegetated excavation site is left unmanaged the area will be invaded by surrounding forest area. The degree of plant invasion and growth on reclaimed excavation sites is determined by the type of excavation site and hydraulic stress caused by groundwater. Groundwater close to the land surface can lead to site invasion by aquatic plants and development of a wetland environment.
- 8) The excavation of wet pits can open up many design opportunities to the operator. An excavation below the water table creating a permanent pond can be designed to accommodate both fish and wildlife.
- 9) Large excavations into the groundwater that create shallow areas around 12 to 18 inches deep can evolve into wetlands. When creating a shallow wetland pond, configuring the pond with an irregular shoreline and sloping adjacent banks to 5:1 or 10:1 both above and below the water enhances the chance for growth of aquatic plants and wildlife habitat. This type of pond excavation provides the excavator with an opportunity to remove large amounts of gravel below the water table; then backfill with excess silts, loams and sand generated from stripping the site or processing of minerals.
- 10) The finer textured material can provide a substrate for natural invasion by aquatic plants or reclaiming the site with aquatic plantings.
- 11) Pond excavations located in the floodplain might incorporate both shallow areas for wildlife and deeper areas for fish. Deeper excavations are important to fish ponds for several reasons. With less light penetration and increased snow depth and ice cover during the winter, aquatic plants in shallow ponds are not capable of producing sufficient ponds oxygen to sustain fish life. The greater depth also allows some degree of thermal stratification.
- 12) A fish pond should have a 3:1 slope or flatter above and below water to a depth of 6 feet, and at least 25% of the pond area should be excavated to a water depth of at least 12 to 15 feet. The deeper water allows storage of more oxygen through the winter months and will likely be cooler during the summer.
- 13) To enhance the pond's fish habitat, the operator should avoid excavating a flat pond bottom. Varying the bottom contours provides more diversity, gives fish more living space, and can result in increased fish populations. If the excavator encounters large boulders not able to pass through the crusher, s/he should consider placing them in the pond. The boulders provide diverse habitat for fish and wildlife.
- 14) Water-logged trees and deadheads are often encountered when excavating a floodplain pond. Instead of piling them up and burning or burying them, the operator can place them along the shoreline to increase diversity and wildlife habitat. If the water-logged trees are placed in deeper water, fisheries habitat can be enhanced. For assistance with designing

fish and wildlife habitat and deciding upon the types of vegetation to plant for enhancement of wildlife, contact your fish and wildlife managers.

- 15) The applicant should analyze the site for basic visual resource values. Consider the appearance and use of surrounding land. Is the site hilly, forested, open agricultural, residential, park, commercial or mixed use? Ideally, projects should be compatible with or enhance surrounding land uses and visual quality.
- 16) Visual exposures to the public should be considered. A nonmetallic mining operation visible from a navigable waterway, public road, public land, residential area, commercial area, etc. may be objectionable.
- 17) Consider preserving existing landforms or vegetation within the project site to completely or partially screen the project from view:
 - a) vegetation, including woods, fence rows, clumps of trees and shrubs (remember that some vegetation only provides summer screening);
 - b) landforms (hills, mounds, islands) that block the operation from view.
- 18) Note any scarce or unique landscape features within the project area that are valued for their appearance:
 - a) individual trees or stands of large trees;
 - b) ponds, sloughs or other water features;
 - c) interesting rock formations;
 - d) interesting historical artifacts.
- 19) Evaluate areas within the site that could be visually improved as part of the operation:
 - a) removal of old buildings;
 - b) reclamation of past excavation scars and debris piles;
 - c) reshaping and vegetating poorly developed ponds;
 - d) removal of old equipment left from previous excavations.
- 20) Consider developing management strategies to reduce adverse visual impacts during the operation:
 - a) select sites where existing vegetation and landforms will adequately screen activities;
 - b) require additional landforms or vegetation as necessary to screen views of the operation;
 - c) determine specific locations within the site where the most unsightly activities could be largely hidden from view;
 - d) consider long-term needs, such as planting trees and shrubs that will aid wildlife. (To be effective, this will require several years of advance planning);

- e) selectively manage existing vegetation on roadside rights-of-way and waterways. Managing *existing* vegetation is economical, contributes to erosion control, enhances wildlife habitat, promotes scenic beauty and screens operations from view.
- 21) Various techniques can reduce an operation's visual impacts. The most common totally screens an area from view through dense vegetation or landforms. The effectiveness of vegetation screening varies depending on species, height, crown density and season. Seasonal variations are striking in a deciduous forest, but minor in coniferous stands.
- 22) In areas that can't be fully screened, excavation and operation activities can be blended with the surrounding landscape to help divert attention. Anything silhouetted against the sky generally draws attention. White on a green landscape is also highly contrasting and noticeable.
- 23) Consider these blending suggestions:
 - a) use colors found in the surrounding landscape;
 - b) locate the most unsightly activities away from landscape features that are most highly valued;
 - c) use vegetation and/or land forms to reduce an operation's visibility.
- 24) Excavation sites needn't become waste lands. Discuss final uses and consider options which may be even more valuable than the minerals extracted from the site, such as:
 - a) a golf course, park or other recreational facility;
 - b) a forest plantation;
 - c) a subdivision centered on a newly created pond or lake;
 - d) a commercial or industrial development.
- 25) Where camouflage techniques are not feasible, it's especially important to arrange equipment and temporary facilities in an organized pattern instead of haphazardly.

3. FIELD INVESTIGATION

If possible, the field investigation should be used to identify soil type, deposit characteristics, surface water, groundwater, vegetation, wildlife and significant land features, as well as to analyze potential impacts from the proposed mining project.

- a. **New and Existing Habitat** - The analysis of natural environments at proposed nonmetallic excavation sites is a critical part of the field investigation. Mining operations inevitably change the type, quantity, and quality of existing habitat. The operator should try to leave habitats undisturbed whenever possible and create high quality new habitat when destruction of the existing environment is inevitable.

Resource managers should ask themselves these questions when reviewing project plans:

- i) What type of habitat is being lost?

- ii) What type of habitat is being created?
 - iii) Will the created habitat be beneficial?
 - iv) Will ponds be created in an area lacking in ponds?
 - v) Will the design of the ponds enhance existing habitats and be beneficial to wildlife?
 - vi) Will an open grassy area be created in a large tract of woodland--an area that could be used by hawks, deer, etc.?
 - vii) Are we losing a riparian woodland and creating more open grassy areas where we already have large farm fields?
- b. Endangered Resources: Plants, Animals, Specific Land Formations, Etc.** - For information on Endangered Resources, look at the Natural Heritage Inventory database. Contact your District Environmental Impact Coordinator about site occurrence. For copies of the database, contact the Bureau of Endangered Resources (BER). Special restrictions may apply to activities in areas with endangered resources.
- c. Floodplains and Wetlands On Or Adjacent to the Project Site** - Boundaries of any floodplain or wetland adjacent to or within a proposed excavation site must be clearly identified on the applicant's drawings. If the proposal involves a wetland within the project boundaries, NR 103 must be followed.

Stockpiling in wetlands and floodplains must comply with local zoning ordinances. It may be wise to mark these boundaries with flagged iron stakes or fences to emphasize this prohibition.

- d. Structures** - Identify any existing or proposed buildings on the excavation site. Determine whether the buildings are in the floodplain. If an access road crosses a stream, make sure the applicant has included all informational requirements for either a culvert, bridge, or ford crossing with the mining application.

Identify where any crushing operation, asphalt plants, stockpiles, topsoil piles, overburden, wastewater discharges, or dewatering discharges will be located. Every excavation project needs work areas for temporary or permanent storage of material. Size of the work areas will vary depending upon the amount of material processed and stored at the site. A 2-4 acre area is a common size for any site that needs to accommodate stockpiles, crushing equipment, sorters, asphalt plants, scrubber ponds and/or a washing plant. Make sure sufficient work areas are clearly located on the applicant's plan.

Operations which include an asphalt plant will usually need at least two ponds to accommodate scrubbers needed to comply with air management requirements. Notify Air Management staff if asphalt plants are proposed. Washing of material will probably require a WPDES permit; contact the Department's Wastewater program if this is an issue.

- e. Aesthetics** - NR 340 recognizes that, without adequate controls, scenic beauty may be seriously degraded during and after excavations. The rule attempts to minimize adverse impacts and rehabilitate disturbed land. It also restricts excavations in some cases.

The operator should seek to maintain, as nearly as possible, a natural landscape similar to the site's original appearance. Buffer zones should be required to minimize visual impacts. Be aware of the existing natural scenic beauty and make sure the applicant's plan adequately protects it.

- i. Determine the scenic beauty of floodplain areas visible from the navigable waterway, the scenic beauty of the project site and the effects mining operations will have on both.
 - ii. Determine the features that add to the scenic beauty of the site, features that are relatively unique along the navigable waterway, and features that would require extensive time for replacement by natural processes.
 - iii. Determine the reclamation activities that would maintain, restore or enhance the site's scenic beauty relative to its condition before mining.
- f. Buffer Zones** - The applicant's drawings and any permits issued for a project must ensure that a buffer zone design will suffice for the purpose stated in NR 340. A buffer zone is not a place to build a haul road, store strippings, store old barrels, store waste materials, or anything else and should be left undisturbed by mining activities.

The width needed for a buffer zone is subjective and circumstantial. Depending on the trees or shrubs to be used and site topography, a "screening" buffer zone along property lines and highways might acceptably be as narrow as 5 or 10 feet. However, the buffer zone adjoining a navigable stream may need to be several hundred feet wide to effectively act as a sediment trap or minimize the likelihood of a "blowout" during flooding.

The mining of material on the landward side of the buffer zone along a stream will reduce the overall strength of the stream's bank to resist the pressures exerted upon it. The width of a proposed buffer zone, the type of material in that buffer zone, channel morphology and vegetative cover determine if a waterway will relocate through an excavation site. Staff engineers can evaluate any analysis the applicants provide to determine if the buffer zone will be breached during a 5, 10, 25 or 100 year flood. Topographic changes in elevation or natural vegetation may provide enough of a break between the waterway and project site to limit the width required for a buffer zone.

Remember to consider the height of proposed stock piles, buildings, etc. when determining if a proposed buffer zone design is adequate. Is the proposed vegetative cover sufficient to hide or distract from these objects? Increasing the buffer zone's width alone may not resolve problems; additional plantings of live woody vegetation may be necessary. The applicant or a qualified consultant or forester should develop a plan for plantings in the buffer zone.

- g. Land Use and Zoning** - The Department's field report should identify present land uses and zoning classifications of the proposed site. Programs such as farmland preservation and swampbuster should also be noted. Discuss the issue of mining agricultural lands with the District Environmental Impact Coordinator.

Compare the present recreational uses of the site, including navigation, with the likely recreational uses after reclamation. The local conservation warden, fisheries biologist, and wildlife manager, as well as local fish and game clubs, may provide valuable information about the area's recreational uses. These sources may be particularly valuable if there is to be a hearing on an application. In some cases the recreational resource created after reclamation (e.g. a public pond, wetland, etc.) can be more beneficial for the public than existing resources (e.g. an open field next to many other open fields).

- h. Stream and Hydrologic Characteristics** - River systems continually undergo changes of position, shape, dimension, and pattern (morphology). In alluvial river systems, it should be expected that over time banks will erode, sediments will be deposited, and other changes to the floodplain, islands or side channels will occur.

Rivers change position and morphology partially as a result of changes in hydrology. Changes may

be very slow or dramatically fast. They can occur as a result of man-made changes in hydrologic (or hydraulic) characteristics, long-term climate changes, or natural climate fluctuations like droughts or floods. Rivers also develop chutes, islands, and cutoff meanders on oxbow lakes through the erosion and deposition process. The lateral movements are also dependent upon vegetative cover, bank stability, flood frequency and land use of the floodplain.

Lateral migration is often so slow as to be unnoticeable over the course of a lifetime. Historical aerial photographs of a project site may reveal channel changes.

- 1) Aggradation vs. Degradation - Aggradation and degradation are caused by changes in hydraulics or hydrology. Aggradation is the process of raising a land surface by the deposition of sediment. Degradation is the wearing down of the surface of rocky cliffs, strata, streambeds, etc., by atmospheric and water action.
- 2) Hydrologic Balance - For periods of time, the land and the climate are at balance or equilibrium. The balance, in large part, is maintained by the vegetation that retards erosion and the land and channel slopes that convey the excess water not used by the vegetation or recharged to a deeper aquifer.
 - a) Watersheds in hydrologic balance undergo, for relatively long periods of time, very little change in:
 - i. vegetation
 - ii. aquatic Life
 - iii. surface slopes and elevation
 - iv. channel slopes, sizes, and shapes
 - b) Hydrologic impacts from surface mining result largely from changes in:
 - i. vegetative types
 - ii. soils types
 - iii. land configuration
 - iv. removal of aquifers
 - c) Hydraulic impacts from surface mining result from changes in
 - i. stream slope (gradient)
 - ii. sediment size
 - iii. sediment load (suspended sediment and bed load)
 - iv. water discharge (outflow)
 - v. channel width
- 3) Impacts identified above may result in changes to the following river and groundwater hydraulics:
 - a) Increased flooding frequency
 - b) Decreased mean annual flow
 - c) Increased erosion and sedimentation due to changes in gradient
 - d) Removal of overburden below the water table exposes groundwater to pollution and evaporation
 - e) Excavation of overburden below the water table on upland sites or in the floodplain decreases water storage capacity while increasing precipitation runoff
 - f) Excavation of overburden down to bedrock on upland sites or in the floodplain decreases water storage capacity while increasing precipitation runoff

- g. Water Quality** - The major sources of pollution from most excavation sites is erosion from haul roads, spoil piles, newly excavated areas, wash water discharges, dewatering processes and active excavation itself. Pollution can also occur if fuel, chemicals, oil and grease at an excavation site are not handled and stored properly. If spills occur and are not attended to immediately, surface and groundwater pollution can occur.

Stormwater run-off permits or Wisconsin Pollution Discharge Elimination System (WPDES) permits may be required. Operators should be advised to contact Wastewater staff for any applicable permits.

NR 340 requires operators to develop a pollution-free plan for handling surface and groundwater diversions and drainage from the project site. The plan must list any physical alterations that will impact a stream or any other body of surface water. In the application, an operator should state whether changes in surface or groundwater conditions will be temporary or permanent.

Natural Resources Board policy (NR 102) prohibits authorization of an operation in "outstanding resource waters" that will lower water quality.

- 1) **Temperature and Dissolved Oxygen Changes** - Temperature and dissolved oxygen content in streams will change if reduction of velocity and spreading of flow over a mined area is reduced. The altered water temperature can influence abundance and diversity of aquatic biota and alter the amount of usable habitat for each species. Increased surface water exposure to solar radiation will increase water temperatures and can lead to a decrease in the amount of dissolved oxygen for aquatic organisms.

The water temperature of unconnected ponds is generally higher than the temperature of the adjacent stream. If a channel is excavated between the pond and stream or if the pond is subject to periodic flooding, the warmer pond water could raise stream temperatures. Ponds with warmer water can be a refuge or spawning site for competitive and undesirable fish species that can enter a stream. This is especially detrimental to cold and/or cool water fisheries. Increased stream temperatures can impact a variety of aquatic organisms besides the fisheries resources. The issue of potential cumulative impacts from increased water temperatures should be addressed when the proposal is reviewed with the fisheries biologist.

- 2) **Erosion and Sedimentation** - Sediments eroded from excavations contribute to the filling in of lakes and streams. Sediment deposits destroy valuable fish spawning beds, smother aquatic organisms, ruin active springs, hasten lake aging, and also change a stream's hydraulics. Operators must comply with a complete and well developed operation and reclamation plan and take adequate precautions while working their site. The applicant must incorporate temporary and long-term erosion control methods.

Vegetation stabilizes the soil by absorbing the impact of rain drops, reducing velocity of runoff, and allowing precipitation to infiltrate the soil. Vegetation provides both temporary and long-term protection from erosion and should be used in all upland areas disturbed by excavation activities.

One major problem is controlling erosion during germination of a long-term vegetative cover seed mixture. Mulch and a companion crop such as rye or oats should be used along with permanent seeding to reduce erosion.

Vegetation is both economical and effective in stabilizing completed excavation sites. Reclamation may be made more difficult by problems such as steep or barren slopes, fluctuating water levels, or droughty soils. When planning permanent revegetation of

disturbed soils, consider climate, soil type, optimum plant selection for the specific site, fertilizer needs, seedbed preparation, mulching, irrigating and the best time of year for seed germination.

In flood prone areas, it may be especially effective to seed with native species in addition to using riprap, and temporary stabilizers. Mulches provide temporary erosion control and allow native plant species to invade a site but are typically unsuitable for floodplain sites. Jute nets or excelsior mats specifically designed for this purpose are a better choice for these sites.

It may be wise to require that the operator save existing trees, shrubs, and other surrounding vegetation as a condition of the permit. Seeds of these species can also help to reforest the reclaimed project site.

Temporary plant cover and/or mulch effectively protect bare areas from erosion during excavation. In projects with high volumes of surface water run-off, an operator might divert water from the erosive area with a channel leading to a detention basin to trap debris and silt before the surface water enters a lake or stream.

Consult the Department's publication, *Wisconsin Construction Site Best Management Practice Handbook* for additional guidance.

- 3) Runoff, Turbidity and Light Penetration - Effective erosion control measures include sediment detention ponds, process-water holding ponds, drainage diversion ditches, haul roads, silt fencing, sediment screens, rock riprap, enclosed stockpile storage areas and fuel storage areas. Temporary ponds, diversion ditches, drainage ways, etc., should be leveled, filled, graded and revegetated during the final closure and reclamation of the site unless other special provisions were made in the permit.

Sediment detention ponds sometimes support wetland plants. Vegetating these sites with wetland species may be economically and environmentally beneficial. If detention ponds or any other physical alterations are to be left in place, they must either be approved in the original proposal or through the permit modification process outlined in NR 340.08.

If review of the proposal and effluent limitations listed in NR 269 indicates that water quality will be degraded, the excavation may be restricted to avoid adverse impacts to surface and groundwater. The project location and type of effluent discharge determines whether the operator can discharge under a general permit or be required to obtain a Wisconsin Pollution Discharge Elimination System (WPDES) permit.

The sediment transport capability of a stream has many variables. The fate of sediments entering a stream is affected by variation of depth, flow, particle size, seasonal fluctuation and man-made alterations. The smaller sediment particles classified as clay, silt, or loam, have the most harmful effect on the aquatic habitat. The average stream velocity is capable of carrying suspended solids, except along areas of reduced flow in pools or wider sections of stream.

Many studies have been conducted concerning the effects of silt on stream biota. The benthic communities composed of algae and aquatic invertebrates act as a sensitive indicator of increased siltation. The benthic population will decrease as suspended solids concentrations increase. In an environment of gravel and rock rubble, most organisms find shelter and surface area to grow and reproduce. When sediments fill the spaces in the gravel or cover, the area benthic organism populations are reduced or eliminated. Even very small deposition of silt can cause a serious population reduction. The benthic organisms in a stream comprises a significant part of fish diets and any reduction in numbers will have an adverse impact on fish populations.

Sediment destroys algae by abrasive action and physical smothering and by reducing the light penetration necessary for photosynthesis. Suspended solids are particularly harmful to the reproduction phases of fisheries: spawning, fish eggs, and fry survival. Damage to fish populations may be both immediate and long term.

- 4) Biochemical oxygen demand (BOD) - The adjacent land uses and location of the excavation site will determine to what extent a pond will be troubled with BOD or chemicals. Unless agricultural runoff enters the excavation or flood waters deposit organic sediment in a pond, you normally should not encounter any immediate BOD problems. Potential BOD effects (primarily oxygen depletion) should be considered if a fish pond results from the mining project.
- 5) Release of Nutrients - The removal of riparian woodlands adjacent to streams can cause an increase in the amount of nutrient runoff reaching the waterways. The removal of vegetative cover generally reduces the retention time and filtration that normally would either slow down the movement of nutrients or tie up the nutrients.
- 6) Gas or Oil Storage Areas and Disposal Process - The storage of oil, gas and other chemicals used by the excavators at sites is a common practice. When processing applications for any excavation in the floodplain, you should work closely with the local county zoning office to assure that the applicant would not violate the local floodplain zoning ordinance and NR 116.

Check with DNR Environmental Quality staff about potential groundwater problems should a spill occur at the site. A common practice of many operators is to drain waste oils from their excavation equipment directly onto the ground when they change oil and filters. When issuing a permit, include a condition to restrict disposal of waste oils at the site. That may help avoid potential groundwater pollution problems and at a minimum should alert the operators that we are aware of that practice. Remember excavations removing overburden open up windows to the groundwater.

- h. Pond Excavations and Fish Entrapment** - Pond excavations in a floodplain will entrap fish. Fisheries biologists usually recommend that at least 25 percent of each pond be at least 12 feet deep. This depth creates sufficient volume for retention of oxygen throughout the winter stress periods when oxygen supplies would otherwise be extremely low. The water quality and groundwater flow in the area of the pond will ultimately determine if the pond will retain sufficient oxygen to maintain aquatic life.

- 1) Public Access to Ponds Entrapping Fish - Department studies confirm that ponds located in floodplains eventually entrap fish. Building dikes or berms around such ponds to prevent entrapment may not be a feasible alternative. If a pond can entrap fish, a public access must be provided by the landowner, per ss. 23.095 and 29.02 and NR 340.06(3)(b). If the project site becomes public property (through donations or sale) the public access requirements will generally be met automatically.

The public access should be dedicated on a recordable document (see the restrictive covenant form in the appendix for a sample). The document should be recorded at the county register of deeds office and submitted with the application and drawings.

Since public access is not required by rule until after reclamation has been completed, it is not essential to have the easement up front. However, it is far less likely to be lost in the shuffle if it comes in with the application. You may also need this document for the environmental analysis required under NR 150.

- 2) Slope diversity - Department wildlife managers recommend creating slopes in ponds no steeper than 3 feet horizontal to one foot vertical. A ratio of five or 10 to 1 is usually preferred. Wildlife managers also prefer a water depth no greater than three feet. You will have to balance the wildlife manager's request against the fisheries biologist's comments and preferences on any given project. As mentioned earlier, a pond with both shallow and deep areas may provide the best habitat.
- 3) Creation of Peninsulas or Islands Within a Pond Site - The creation of ponds with meandering shorelines, peninsulas, and islands increases the amount of habitat edge available for fish and wildlife use. Ponds with a greater amount of diversity usually look more natural and tend to blend into the surrounding environment if they are properly reclaimed.

- i. **Habitat Creation With Waste or Spoil Materials** - Often the excavator can create habitat with materials that are normally viewed as waste or spoil products. Instead of burying stumps, logs or large boulders, the operator may want to use them to create fish or wildlife habitat. This solution is often easier and more economical than burying, as well as being environmentally desirable. Stumps, logs and boulders placed along a pond's shore, for example, create visual diversity, increased edge, and loafing spots for ducks and turtles.

Waste material (nontoxic) in many cases consists of nonmarketable clay layers, sand, silts or boulders too large for the crusher. This material either has to be removed from the site or blended into material used for reclamation. In some cases, large boulders can be placed with riprap required for erosion control or placed in an excavated pond for fish habitat.

Proceed with caution when backfilling of an excavated area with clays. Any placement of clay on slopes can create an impermeable layer that will be hard to revegetate. If clays are available, they probably are best used on the shallow end of unconnected ponds. This finer-textured material provides a substrate for growth of aquatic plants beneficial to wildlife.

In cases where sufficient waste material (sand, silts, clays) are not available for backsloping and grading of a vertical cut (high wall), the operator will not be able to excavate right up to project lines. It may be to the benefit of the operator to leave some material along boundary lines for backsloping. This will probably be cheaper than hauling in material from another site to meet setback and sloping requirements.

Overburden piles provide a nucleus for revegetation of abandoned sites. The organics, and particularly the root stocks and slash, facilitate re-establishment of vegetation in localized areas of the site. Overburden piles are used for den loving animals and, because they usually are vegetated, provide habitat for small mammals and birds. Abandoned stockpiles of sand, gravel, or other processed material is not as conducive to providing habitat for burrowing animals. In some cases you may be able to leave small segments of high wall (5 to 6 feet) for burrowing animals and swallow nesting sites.

- j. **Flood Flow Capacity** - Any berms, dikes, or stockpiles on a site could deflect or otherwise modify flood levels and flow patterns or aggravate the long-term hydraulics at a site. Modifying flow patterns and flood levels could lead to modified hydraulic forces in the local reach of the floodplain and cause other environmental damage.

- 1) Flood Dikes or Berm - The construction of flood dikes, berms, or other similar structures usually has not been an affordable solution for keeping water out of an excavation site. In the past, dikes have not functioned as anticipated. The cost of constructing dikes or berms that will function properly is often prohibitive.

If the proposed development will have a total area that exceeds 5 acres, or an estimated cost

exceeding \$125,000, the applicant should be required to provide all computations necessary to show the effect of the project on flood heights, velocities, and floodplain storage. This requirement is found under NR 116.20(2)(a)4. Depending upon the outcome of the study the applicant may be required to secure an amendment to the local floodplain map and ordinance and flooding easements from affected property owners before the Department can authorize the project.

Aquatic biota can be affected by the construction of dikes and stockpiles. Fish can become entrapped behind dikes that impound water. Fine suspended particles (silt, silt loam soils, etc.) resulting from stockpile or dike erosion can adversely affect fish and reduce invertebrate populations.

The location of stockpiled material in the floodplain can have a long-term effect, especially if stockpiles that effect flow patterns and flood levels are abandoned at a site. Removal of all stockpiles must be required in the permit and confirmed prior to the release of any bonds.

- 2) **Groundwater Infiltration vs. Increased Runoff** - Changes in groundwater infiltration will depend upon the depth and acreage of an excavation, amount of vegetation removed, and whether the site is openly drained into an adjacent waterway. Runoff increases as you continue to remove vegetative cover and mine the overburden and subsoils, changing the ground elevations along waterways. Once vegetative cover, overburden, and subsoils have been removed, retention of subsurface water that once infiltrated and slowly fed adjacent waterways and wetlands is either decreased or eliminated. The cumulative impact of continued excavations along a waterway will eventually increase downstream flooding.
- k. Easements and Leases to Excavate Material** - If the applicant does not own the project site, copies of any leases or easements signed by the landowner must be submitted with the application. These are necessary for the environmental analysis.
- l. Gas Line or Powerline Crossings** - Gas line or power line crossings may warrant careful consideration. They must be protected from scour, exposure, suspension or inadvertent impact or destruction during the excavation process and from operation of heavy equipment on haul roads which pass over them.
- m. Dust Creation and Control Techniques** - Contact Air Management staff to assure compliance with air quality standards. Fugitive dust from haul road, crushers and stockpiles can be a nuisance.
- n. Equipment Noise** - Draglines, backhoes, and trucks create noise that can interrupt or alter established wildlife patterns along a river corridor. Does the site have a high wildlife habitat value? If so, try to determine whether the project would temporarily or permanently displace wildlife onto adjacent habitat or cause a decrease in total numbers of animals.

Depending upon the location of the excavation, recreational users and/or local residents may be disturbed by equipment noise. Time of day and/or day of week restrictions may be necessary to prevent or alleviate a nuisance condition.

- o. Cumulative and Secondary Impacts** - The cumulative impacts of nonmetallic mining on a waterway system, fisheries, wildlife, water quality, public interest in recreation, scenic beauty and river hydraulics depends on the frequency, duration, and locations of existing and future nonmetallic mining operations. Fish and game managers and other staff should be consulted when evaluating potential cumulative impacts. The impacts caused by bank excavation or dredging on a small straight river with a narrow floodplain will be greater than a similar excavation on a large braided river with a wide floodplain. This is due to the larger river's ability to absorb more changes in fish and wildlife populations before habitat depletion or changes to the river's hydraulics are

noticed.

The impacts of continued removal of the wooded riparian corridor, especially in highly developed areas where riparian wood lots are limited, must also be considered.

4. OTHER SOURCES OF INFORMATION

- a. **County Soils Maps** - See your local Soil Conservation Service (SCS) office for current copies of SCS soil maps and wetland maps.
- b. **DNR Air Photographs** - Contact your local DNR forester to determine if air photographs are available for your counties. Limited coverage may also be available through the forestry section of local paper mills or local forestry consultants. If the project is located in or near a national forest, the U.S. Forest Service may have current and/or historical aerial photographs.

The Wisconsin Wetland Inventory has black and white infrared aerial photos of the entire state taken in 1978-79. The scale is 1:20,000. Call 608/266-8852.

Limited air photograph coverage for selected counties is presently located at the Tomahawk DNR office for 1978, 1979 and 1980. Older DNR air photographs formerly stored at the Tomahawk DNR office are now at the *Arthur H. Robinson Map Library, UW-Madison*. Call (608) 262-1471.

- c. **ASCS Aerial Colored Slides** - Most Agricultural Stabilization and Conservation Service (ASCS) offices take colored aerial slides of their county each year for crop subsidy programs. Some only take colored slides of the crop land; others fly the entire county. The slides usually cover one square mile and can be viewed at your local ASCS office. Since slides are in color and the county is flown each year, the information can be very valuable when trying to determine past history or the size of a project site or excavation. Slides can usually be purchased for \$1.00 at the ASCS office.
- d. **ASCS Aerial Photographs** - The ASCS agent in each county has black and white or color photographs. Usually these cover the entire county.
- e. **Wetland Maps** - DNR wetland maps and SCS wetland maps.
- f. **Floodplain Maps** - Available for review at local zoning offices.
- g. **Department of Industry Labor and Human Relations (DILHR)** - DILHR has a listing of all excavators who mine material in the state of Wisconsin, as well as a list of mining sites.
- h. **Relevant Publications** - Described throughout this chapter.
- i. **Department of Transportation (DOT)** - Retains negatives of all aerial photographs produced for the Wisconsin Wetland Inventory. Contact prints on photographic paper (9" x 9") may be purchased for \$3.50; enlargements on diazo paper (24" x 24") may be purchased for \$2.00. In both cases, add \$2.50 for shipping. Call 608/266-0309 to order (inquire about current prices).
- j. **Department of Revenue (DOR)** - Retains computerized lists of nonmetallic mining sites (includes sites which are not located adjacent to waterways).

F. TYPES OF EXCAVATION/RECLAMATION OPTIONS/PROBLEMS

1. TYPES OF EXCAVATION

- a. Upland Excavations: dry pits and ponds.
- b. Floodplain Excavations: unconnected ponds, connected ponds, and dry pits.
- c. River Channel Excavations: dredging, channel enlargement and gravel bar removal (middle, point, and lateral bars).

2. RECLAMATION OPTIONS

- a. Restoration to original condition.
- b. Rehabilitation of some desirable characteristics.
- c. Development of ecosystems unlike the original, but desirable for various reasons.
- d. Natural reclamation when evidence suggests that unaided natural processes will produce better results than human intervention.

3. COMMON RECLAMATION PROBLEMS

- a. Lack of topsoil.
- b. Droughty soils.
- c. High groundwater imposes hydraulic stress impeding vegetative growth.
- d. Excavations in the floodplain inundated by floodwater, entrapping fish and impeding vegetative growth.
- e. Shallow bedrock areas impossible to revegetate.
- f. Exposed bedrock cannot be revegetated.
- g. Lack of operator's technical skill to revegetate sites.

G. REASONABLY EXPECTED IMPACTS FROM NONMETALLIC MINING

1. A DRY UPLAND EXCAVATION COULD BE DUG WITH THE FOLLOWING EXPECTED IMPACTS

- a. Removal of existing vegetation will alter existing habitats.
- b. Erosion of upland excavation sites will increase deposits of sediments in surface water.
- c. Excavations that remove overburden (part of the aquifer) can decrease stream flow but increase groundwater recharge.
- d. Removal of overburden will increase potential for groundwater pollution.
- e. Excavation of overburden down to bedrock will decrease groundwater aquifer capacity, water retention, and mean annual flow of streams. It will increase surface water run-off and, possibly, flood frequency.

2. AN UNCONNECTED POND COULD BE DUG WITH THE FOLLOWING EXPECTED IMPACTS

- a. Less material may be obtained from an unconnected pond than from a connected pond because a portion of the bank would not be removed. However, pond excavations disturb less surface area to obtain a given amount of gravel than surface grading above the groundwater.
- b. Fish entrapment could occur in unconnected ponds constructed in the floodplain. Fish entrapment in a private pond is inconsistent with ss. 29.02 and 23.095, unless public access is provided.
- c. A pond excavated away from an active river channel should cause little or no change to the natural hydraulic process of the channel. Where pits are seasonally connected to a channel, some change to the hydraulics of a river can occur. The most obvious alteration occurs during spring break-up when high water flows throughout the floodplain.

An unconnected pond in the floodplain will fill with flood water during high flows. The pond could eventually connect to the river channel due to erosion. Eventually this could reroute river flows through the excavation site.

- d. An unconnected pond excavation located on the inside bend of a meandering stream, is more likely to cause permanent alterations to flows. Even if undisturbed buffer zones separate the pond from the river channel, flood water can overflow the site and exit into the downstream reach of the meander surrounding the site.

If a buffer zone is structurally unstable, erosion can cause a breach to occur, thus connecting the pond to the active river channel. For a meandering stream, the down valley distance through a pond on the inside of a bend is shorter. Consequently, there would be a tendency for permanent redirection of river flow through the excavated site and eventual cut-off of the main channel.

- e. Excavation of an unconnected pond does not usually affect the water quality of the active river channel. However, the water quality may be different in the pond than in the river channel.

During open water conditions, the pond will typically have higher temperatures than the river. Also, the dissolved oxygen levels tend to be lower in the pond than in the river channel and sometimes stratification of both temperature and dissolved oxygen can occur in the pond.

The river channel can relocate through a pond if the buffer zone is not large enough or durable enough to withstand erosive forces. In situations where the river channel flows through the pond, the difference in water quality of the river and pond environment could be less. The difference depends upon the pond size and degree of mixing.

- f. The difference between aquatic biota in the active river channel and pond site is dependent upon the opportunity for exchange of organisms. Those ponds that are separated from the river have little potential for exchange and are typically less productive.

The likelihood for injection of nutrients and organisms into a pond site by flood flows depend on site location and design. If the pond is located in a floodplain but surrounded by a broad undisturbed wooded buffer zone, the productivity may be low.

- g. The effects of excavating an unconnected pond on the scenic quality of an area is totally dependent upon the diversity of a floodplain's environment and project design. A pond has less effect on the scenic quality of an area where oxbow lakes occur naturally than on areas where these types of aquatic systems do not occur naturally. The excavation of a pond with angular perimeters that ignore the natural contours of an oxbow lake, will have a high visual contrast even in areas where oxbow lakes occur.
- h. Excavation of a pond exposes the groundwater and removes a portion of the watershed aquifer. Removing a portion of an aquifer decreases mean annual flow, increases flood frequency, and decreases filtration of water entering the remaining aquifer.
- i. Upland woodland or riparian woodland habitat may be converted to aquatic habitat.

3. A CONNECTED POND COULD BE DUG WITH THE FOLLOWING EXPECTED IMPACTS

- a. Wildlife habitat in either the floodplain or upland could be lost.
- b. Excavation of a pond connected to the river channel could cause changes to the river hydraulics.
- c. The river bank between the pond and the river would be partly excavated for the outlet channel.

The river flow could reroute through the pond both during and after flooding. The relocation of a stream through a pond increases sedimentation and causes a loss of river habitat.

- d. The impact upon aesthetics would be greater than for unconnected ponds, because the excavation would be visible from the river at the connection. If the river rerouted through the pond, additional degradation of the aesthetics would occur.
- e. The connected pond may have habitat potential for fish and/or wildlife, depending upon the size, depth, and side slopes. A variety of side slopes and depths could produce habitat for both fish and wildlife. The wildlife habitat of a pond environment will be different than the wildlife habitat provided by the natural riparian or upland vegetation prior to any excavations.
- f. A connected pond located in the floodplain will be inundated when high water flows spread throughout the floodplain. Erosional processes at the pond's upper end could cause another connection between the pond and the river. This could significantly enlarge the river channel if flows are rerouted through the excavation site. The loss of natural stream habitat and the different environment provided by a pond will have an impact upon fish populations and species make-up.
- g. The differences of aquatic biota between the active river channel and pond site are dependent upon the opportunity for exchange of organisms. Ponds connected to the river channel through either inlets or outlets provide a greater opportunity for exchange of organisms between the two systems. The likelihood for injection of nutrients and organisms into a pond site by flood flows is dependent upon site location and design.
- h. The still water in a pond is generally warmer than the river waters, providing conditions for productivity of various aquatic organisms. Fish well-suited to still water environments, such as northern pike, can utilize the pond for feeding and spawning. Excavation of a pond near trout water may lead to the introduction of less desirable fish species in the trout streams, which may compete with native species.
- i. The potential for ponds to provide a more diversified fish community in the river also exists because of the connection between the two systems. This increased community diversity may be restricted to the reach of river immediately adjacent to the pond site. Depending upon the river type, a pond may cause negative impacts to the fisheries population and diversity.
- j. Pond depth and design are important to fish utilization. Obstructions to movements are not a factor during open water periods if an outlet is available for fish movement between the river and pond. Fish entrapment may occur in winter if ice cover on the channel limits or stops fish movement. Fish survival will then depend upon sufficient depth and water quality entrapped pond.
- k. The creation of a pond in a floodplain constitutes a major change to the local terrestrial environment. Pond excavations are usually situated on a vegetated floodplain; consequently, terrestrial habitat is almost always destroyed. The depth of pond excavation and permanent inundation that result also greatly retard or prevent the long-term reestablishment of pre-disturbance conditions. What most frequently occurs is the creation of a more diverse habitat with moderate changes in the faunal communities.
- l. The creation of a pond in a floodplain containing a meandering river with oxbow lakes will merely add to the habitat diversity in a localized area. Where ponds are located in floodplains lacking oxbow lakes, the effect is again principally local but has implications for a much larger system.

Example: A pond may attract migrant waterfowl and shorebirds and provide habitat suitable for nesting and rearing that did not previously exist. The higher aquatic productivity of some ponds may provide food for those species adapted to feeding in ponds and lakes. In some cases the loss of

terrestrial wildlife habitat for certain species may be more significant than the benefits.

4. A DRY SHALLOW EXCAVATION IN THE FLOODPLAIN COULD HAVE THE FOLLOWING EXPECTED IMPACTS

- a. Fish entrapment would occur on excavation sites not drained by a channel to the river. Once the floodwater recedes, the shallow temporary pool would not be capable of supporting fish life. This would be inconsistent with ss. 29.02 and 23.095.
- b. The floor of the shallow excavation and immediate slopes would not be useable by wildlife for nesting due to periodic flooding.
- c. The floor of shallow excavation near groundwater will never revegetate to the original cover type. The hydraulic stress created by high groundwater impedes both planted or invading vegetation from totally revegetating a site. If adequate quantities of either organic or silty soils are in place on areas with high groundwater, wetland plants will probably invade the site.
- d. The excavation of a shallow basin open to the river could alter the river hydrology, depending upon location and size of the project.
- e. The river channel could relocate through a shallow excavation site or be relocated by the excavator. The speed at which a river relocates is dependent upon site location, size, and erodibility of buffer zones left between the river and excavation site. The reclamation and replacement of a river channel to its original channel is almost impossible, and a very costly task for both the Department and operator. Situations where a river channel could possibly relocate or are proposed to be relocated should be avoided.
- f. Shallow excavation sites separated from a river usually disturb more vegetative habitat than other types of excavations because comparatively small quantities of material are obtained per surface acre.
- g. Wildlife habitat in the floodplain may be lost, depending on the project size and location.
- h. A dry shallow excavation located in a wooded floodplain will have a high degree of visual contrast with the surrounding environment. The final configuration of the excavation, extent of revegetation, types of species, and height of the vegetated border will determine the degree of contrast.
- i. Stockpiles of excavated material and overburden in the floodplain will contribute to the sediment load during periods of flooding and high precipitation.

5. DREDGING OF MATERIAL FROM RIVER CHANNELS CAN CAUSE THE FOLLOWING IMPACTS

- a. The substrate is changed from rock or gravel to sand and silt.
- b. Benthic organism populations and species diversity are adversely affected by the change in substrate from rock or gravel to sand and silt.
- c. Increased turbidity from dredging may contribute to the reduction of benthic organisms. This is due to an increased drift rate caused by turbid water. The overall immediate effects of turbidity on fish will probably not be significant if sediment load is below 25 ppm.
- d. The gamefish population is decreased, while rough fish populations increase.

- e. Fish habitat would be altered decreasing the amount of undercut banks, spawning areas, pool:riffle ratio in the river, vegetation on the banks, and quantity of rock rubble substrate.
- f. The removal of the bed's coarse fraction reduces the degree of control played by rock and gravel to armor and stabilize channel patterns and bed form. The coarser fractions, particularly rock rubble or gravel, armor the bed and retard excessive scour, stabilize banks and bars, and ultimately lowered sediment movement. Removal of the gravel armor can lead to erosion and loss of control. As a result, meandering reaches may become braided due to increases in velocity and bed material transport. Localized hydraulic changes may cause deterioration in an adjacent reach of the river. The hydraulic equilibrium of the river is disrupted by the effects of dredging, including bank erosion, head cutting, shifting of channel and decreased armoring of the bed. In braided systems, the channel generally shifts throughout the active floodplain on an annual basis. This is due to the lateral instability of the channels.
- g. Reduced velocity of water entering the dredged area will cause deposition of both bed load and suspended material (aggradation). This will aid in replenishing the gravel removed from the site. When dredging is done in the active channel, the replenishment rate is high compared to other areas in the floodplain. However, the duration of a dredging operation and the size of the project site leads to a related decrease in particle size and quality of material.
- h. Dredging can cause hydraulic changes both upstream and downstream. The degree of change depends on the extent of dredging, changes in elevation, types of substrate and amount of the natural river bank disturbed by the project. The natural hydraulic forces changed by dredging can result in increased velocities upstream resulting in increased sediment transport capacity. Because of dredging, the channel bed is steepened in a short reach immediately upstream. This causes erosion and a general upstream progression of the steepened slope (degradation). The erosion will continue upstream until equilibrium is reached. Because the dredged area absorbs the normal bed load of the stream, equilibrium is lost downstream of the project too. To be in equilibrium streams must carry some bed load. To again achieve equilibrium, scour and erosion will be accelerated downstream.
- i. In-channel dredging has little or no effect on aesthetics unless riffles are removed or large areas of the bank or gravel bars are denuded of vegetation and graded. Removal of bank vegetation normally occurs on dredging sites.
- j. Upland wildlife habitat would receive minimal disturbance. Wildlife located in habitat adjacent to the dredge site may be displaced while the site is being dredged.
- k. Dewatering of dredge material requires stockpiling in the floodplain. Stockpiles in the floodplain may not conform with NR 116. Dewatering of the stockpiles may increase the sediment load in the waterway.
- l. Dredge holes could be dangerous to the public who use the river.
- m. Sediment deposited in dredged areas could lower dissolved oxygen if the biological oxygen demand of the silt is high.
- n. A change in river hydrology may cause a decrease in mean annual flow.
- o. Living space for fisheries is increased for a short period until sediment deposition fills in the excavation site.
- p. Vegetation is depleted or altered by equipment working along the shoreline.

- q. Hydraulic dredging can increase turbidity in the stream and at the site of the retention basin if the retention basin was not properly designed.
- r. A break in the transfer pipes used for hydraulic dredging could lead to increased water turbidity and filling of a wetland or floodplain.
- s. Improperly designed and improperly sized retention ponds used as settlement basins for hydraulic dredging can lead to increased water turbidity and wetland or floodplain filling if the dike around the pond either fails or is overflowed.
- t. The excavation and dredging of point, middle, and alternate gravel bars are expected to cause the following impacts:
 - 1) The material site along with equipment and stockpiled material would be inundated temporarily during high flows.
 - 2) The river flows would spread out over a wider area reducing velocity and causing deposition of suspended solids and bed load materials. The deposition would replenish material on the excavation site.
However, a reduction in channel stability could occur after site closure. This can be detrimental to the establishment of permanent biotic populations, in particular, benthic organisms. Finer textured materials would likely be deposited in these dredged areas; thus, changes in the structure of benthic communities could be expected. These species changes would be from organisms adapted to coarse substrate to those able to exist on a finer textured, less stable substrate.
 - 3) The immediate impacts on large rivers can be relatively less for removal of a given amount of gravel than the impacts upon a small river.
 - 4) The spreading of water over a wide reach of the river and reduced velocity can change water temperatures during the open water season. The altered water temperatures may influence the abundance and diversity of aquatic biota by altering the amount of usable habitat for particular species.
 - 5) The removal of islands (middle gravel bars), point gravel bars, and alternate gravel bars with a vegetative cover can affect the scenic quality of an area. The aesthetic effect can be quite noticeable due to the visual contrast with the natural condition, both upstream and downstream from the excavation site.
 - 6) The excavation of unvegetated point, middle, and alternate gravel bars would not have as great an impact upon aesthetics. The visual contrast of barren gravel bars should not differ from the visual contrast an excavated gravel bar would project. A minor visual contrast could exist due to changes in the form, lines, color, and texture caused by the excavation of an unvegetated gravel bar.
 - 7) The magnitude of impacts to the environment depends on the river's configuration (straight, sinuous, meandering, split or braided) and the size, location, and extent of the proposed excavation. Excavating or dredging on a small straight river with a narrow floodplain will be more noticeable than a similar excavation on a large braided river with a wide floodplain. This is due to the larger river's ability to absorb more changes in fish and wildlife populations before habitat depletion or changes to the river's hydraulics are noticed.
 - 8) Rock rubble substrate used as habitat by aquatic species is depleted.

- 9) Removal of barren gravel bars and dredging below OHWM increases living space for fisheries.

6. CHANNEL ENLARGEMENTS ARE EXPECTED TO CAUSE THE FOLLOWING IMPACTS

- a. Shoreline vegetation is lost.
- b. Existing habitat is altered or lost.
- c. River hydraulics are altered.
- d. Rock rubble source is depleted.
- e. Microorganism population is depleted.
- f. Microorganism species structure is changed.
- g. Stream gradient is changed.
- h. Erosion increases due to gradient changes.
- i. Substrate is changed from gravel to silt.
- j. Fish populations are changed from game fish to rough fish.
- k. Bank stability is decreased.
- l. Also, see items listed above under dredging for impacts that may be applicable.

H. FINAL DISPOSITION

The permit should specify exactly what is being authorized. Standard permit language states that the project must be carried out according to the plans submitted. All information submitted orally by the applicant must also be incorporated in the applicant's plans and/or accompanying narrative. Department staff should clarify the final plans with the applicant. Plans should then be stamped FINAL, dated, and signed by the Water Management Specialist.

It is essential that clear, detailed file records be maintained. Nonmetallic mining projects usually continue for years and have high financial stakes. A statement regarding how and under what circumstances the applicant's bond will be used or released should be kept in the file. The applicant should also have copies of this statement, the permit and final approved plans.

The file must include a list of conditions and be complete in these details:

1. Erosion control measures to be implemented should be identified in the permit;
2. Blueprints can fade and lose essential detail. Avoid loss of information by re-stating information drawn on plans;
3. State the time frame for the permit (the initial permit can be issued for a period not greater than 10 years) and any progressive reclamation activities. You may wish to encourage shorter project durations by stating "the nonmetallic mining operation shall remain open for a minimum period of time";
4. The applicant should be required to report annually on the status of the excavation and restoration. Having a plan view and cross section diagram of work completed submitted before the end of the calendar year is a relatively simple way to accomplish this. It will aid you in conducting your mandatory annual inspection and it will keep the applicant involved in the permit process;
5. The bond amount, form, and conditions should be clarified in the permit;
6. The applicant must understand the authority of the Department to intervene in the event of an emergency (such as a flood that threatens the integrity of a berm). A standard condition in the permit stating that the Department retains continuing jurisdiction over the project and that the applicant must perform the action under the direction of the Department assures that this authority is clear;

7. Floodplain excavation where fish entrapment would occur shall be of sufficient permanency, size, depth and quality to sustain fish and aquatic life and shall be open to the public for fishing after reclamation has been completed;
8. A marked, convenient public access from the waterway is required for ponds constructed in the floodplain because of fish entrapment. Documentation of a legal recordable dedicated access must be submitted with the application;
9. At the end of each permit there must be a notice of appeal rights and procedures for any person seeking administrative or judicial review of the Department's decision.

If investigation of an application shows that the proposal will not meet the required standards, the Department may deny the application without public notice [see NR 340.06(4)]. The applicant may request a public hearing pursuant to s. 227.42 or judicial review under s. 227.52.

I. MONITORING

NR 340.10 *requires* that the project be inspected at least once each year to determine conformance with the permit and progressive reclamation plan. It is strongly recommended that at least two inspections be conducted, once during the growing season and once in the fall. If corrective actions are needed in the spring, there is still time for revegetation to be successful.

The annual site inspection form found in the appendix can be used to document your inspection.

J. ENFORCEMENT

Operators should be made aware that enforcement actions could result in serious consequences. Under NR 340.06, they are ineligible for permit renewals if a proceeding for revocation or violation of the permit has been initiated during the term of the permit.

Given the magnitude and economic scope of these projects, the Department should work with the applicants to ensure that they are in compliance. For example, if an operator inadvertently slightly exceeds the boundaries of his operation plan, we can advise them to seek a permit modification under NR 340.08. Notwithstanding the above statement, if we are working with a bad actor who refuses to cooperate even though they know the potential consequences of their action, we should vigorously pursue enforcement.

NR 340.07 gives the Department considerable power and leverage to ensure that an operator fully complies with the permit and operation plan. Where warranted, operations may be halted until corrective actions have been completed. If necessary, the Department may:

1. halt the operation;
2. rescind the permit; or
3. call the bond or cash in the bond alternative.

These actions may be much more costly to an operator than any forfeiture obtained under s. 30.298. Calling in a bond can impact the operator's long-term line of credit. NR 340.06(4) requires the Department to deny any future permit applications if the applicant has previously failed and continues to fail to comply with the statutes or permits issued under these sections.

An operator found either conducting project operations without the required permits or violating the conditions of a permit may be ordered to cease all operations immediately and submit a reclamation plan for the land already affected. Continued operation and after-the-fact permit approval is prohibited until the reclamation plan has been approved by the Department and necessary progressive reclamation has been

completed.

A person violating the nonmetallic mining permit is subject to a forfeiture of not less than \$100 nor more than \$10,000 under s. 30.298(1). Abatement, pursuant to s. 30.298(5), should be requested when appropriate. Also, under s. 23.79(3), the court may order the defendant to abate a nuisance, restore a natural resource, or take other appropriate action designed to eliminate or minimize any environmental damage caused by the defendant.

Enforcement actions should be initiated with the local conservation warden through the appropriate circuit court in accordance to M.C. 4112.1. Only when insufficient disposition of the case has been adjudged (refusal of district attorney to prosecute, dismissal or no abatement ordered when appropriate), should action be pursued in accordance with s. 30.03 procedures.

K. EDUCATION

Educating operators about NR 340 requirements and related statutes will save both time, money and frustration for all concerned. The applicant's clear understanding of requirements can reduce or eliminate the need for plan amendments.

A letter introducing yourself and the law to all the known operators in an area is a very effective educational tool. Include a copy of NR 340 and the *Operator's Guide to Nonmetallic Mining*. Make it an information package, not a threat ordering compliance. Provide consultants who work on Ch. 30 and NR 340 projects with a similar package. Be sure to indicate to both groups that you are available to meet to discuss these requirements.

Your steps to educate prospective applicants about nonmetallic mining laws may weigh in your favor should there ever be legal action involving the Department and the operator. A mailing list of prospective applicants can be generated with the help of local telephone books. DILHR has a list of all operators that work in the state.

You may want to share the same letter and materials with the local district attorney or judge if prosecution becomes necessary. You may also want to invite him/her into the field for an on-site inspection.

A news article can be used to inform the public of any water law. Work with the district Public Information Officer to write and disseminate such a news article.

ATTACHMENTS

1. Operator's Guide to Nonmetallic Mining
2. Bond Form
3. Bond Approval Letter
4. Declaration of Restrictive Covenant (for public access to ponds)
5. Annual Site Inspection Form
6. Application Supplement: General Project Information
7. Application Supplement: Reclamation Costs Estimate
8. Related Publications

Attachments 2-8 may be appended to the *Operator's Guide to Nonmetallic Mining* for distribution to nonmetallic mining operators.

**OPERATOR'S GUIDE
TO
NONMETALLIC MINING**

This manual was prepared for use by sand, gravel, and rock excavators and private consultants applying for permits under Chapter 30--Wisconsin Statutes and NR 340--Wisconsin Administrative Code.

It provides answers to general questions relevant to the initial application process.

Prepared by the Bureau of Water Regulation & Zoning
Wisconsin Department of Natural Resources
1992

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NOTE: Review and processing of completed Chapter 30 applications for nonmetallic mining permits takes time. DNR staff reviews application forms and supplements, conducts field investigations, and completes environmental assessments. This process may take six months or longer. Incomplete applications slow the process considerably.

Please provide all information outlined in this manual. Do not indicate N/A when answering any question unless that option is offered. All requested information is needed for a complete application package.

The best time of year to submit a completed application and drawings with all the required information is around September 1. This allows the DNR to conduct a field inspection and review the project site before freeze-up or snowfall. Paperwork and writing of the required environmental assessment can then be completed during the winter months so a decision can be made before the following spring.

SECTION I

Questions and Answers About Application Permits

1. I want to: Excavate nonmetallic minerals (sand, gravel, clay, peat, rock, asbestos, beryl, feldspar, talc, topsoil etc.) from a site. In general, what regulations may cover my proposed excavation?

ANSWER: Chapter 30 of the Wisconsin Statutes, NR 340, Wisconsin Administrative Codes, and county permits may be required for excavations in upland areas. Permits are required in all shoreland, floodplain, and wetland zones. Contact your area DNR Water Management Specialist and county or city zoning office. Zoning staff administer floodplain, shoreland, and wetland regulations.

2. I want to: Excavate material and create a pond. In general, what regulations may cover my proposed excavation?

ANSWER: A permit under Chapter 30 is required for ponds within 500 feet of navigable water, or if a pond ultimately connects to navigable water, or is connected via a channel to navigable water or is located on any definable stream channel (See Figures 1 and 2).

Note: Contact your local zoning administrator to see if a county zoning permit is required.

3. I want to: Excavate material from a floodplain or high bank adjacent to a stream or lake. In general, what regulations may cover my proposed excavation?

ANSWER: A permit under Chapter 30 is required for excavations disturbing an area in excess of 10,000 square feet on the bank.

Note: Contact your local zoning administrator to see if a county zoning permit is required.

4. I want to: Dredge material from a creek, stream, river, slough or lake bed. In general, what regulations may cover my proposed excavation?

ANSWER: A permit under Chapter 30 is required for excavation of material from any stream, creek, or river regardless if the stream or creek is navigable or nonnavigable. A Chapter 30 permit is also required for excavation of material from a navigable slough. A contract is required for excavation of material from a lake bed.

5. I want to: Excavate material while enlarging a creek, stream, river, slough or lake. In general, what regulations may cover my proposed excavation?
- ANSWER: A permit under Chapter 30 is required for enlargement of any navigable waterways.
- Note: Contact your local zoning administrator to see if a local county zoning permit is required.
6. I want to: Grade and excavate material (sand/gravel bar) from a creek, stream or river channel. In general, what regulations may cover my proposed excavation?
- ANSWER: A dredging permit is required for removal of material from any water body.
- Note: If the excavation (sand/gravel bar) is above the Ordinary High-water Mark and does not disturb an area in excess of 10,000 square feet, no permit under Chapter 30 is required.
- Note: Contact your local zoning administrator to see if a local county zoning permit is required.
7. I want to: Excavate material and relocate a stream, creek or river channel. In general, what regulations may cover my proposed excavation?
- ANSWER: A permit is required for relocating a navigable stream, creek, or river.
- Note: Contact your local zoning administrator to see if a local county zoning permit is required.

[2 pages of figures appear here]

SECTION II

Chapter 30 and NR 340 Application Requirements

The following information applies to nonmetallic mining and reclamation associated with navigable waterways or adjacent areas that require either a permit or contract under Sections 30.19, 30.195, or 30.20, Wisconsin Statutes.

A permit may only be granted if an activity will not injure or be detrimental to public rights or interest in the waterway involved. Without adequate controls, excavation, dredging or grading in or near navigable waterways can cause serious degradation of water quality, fish and wildlife habitat, and public interest in recreation and scenic beauty.

It is the purpose of NR 340 to avoid unnecessary adverse effects and minimize the unavoidable adverse effects caused during and after such activities, to provide for the expeditious rehabilitation of affected land, and to restrict excavation, dredging and grading where the adverse effects cannot be minimized or avoided.

Natural Resources Board policy recognizes:

1. Streams are sensitive to the large-scale removal of native material from the streambed and immediate banks.
2. The potential consequences of this removal can be significant where the equilibrium of the stream is altered. Compensating aggradation or degradation of the channel can occur downstream from the project location, or where the stability of the streambank is reduced and erosion, slope failure and siltation result.
3. Aquatic resources can be significantly harmed by erosion, deposition, aggradation or degradation. The Board also recognizes the difficulty in predicting when or where such effects will occur and, especially, the difficulty of minimizing those effects once they have been detected.

Natural Resources Board policy requires:

"... nonmetallic mineral excavation in the channel and immediate banks of streams be carefully regulated in order to avoid or minimize adverse effects on aquatic resources. Therefore, the Department shall, in its review of permit applications under this chapter, presume that excavation in the channel and immediate banks should be avoided where reasonable alternatives are available. The Department shall require applicants to convincingly demonstrate a need for excavation of the channel or immediate banks by demonstrating after investigation that reasonable alternatives are not available. The Department will only concur in such excavation when the applicant has demonstrated by a preponderance of evidence that the excavation is technically, economically and environmentally feasible and meets other applicable requirements of law ... *no* operation may be authorized in navigable waterways designated in s. NR 102.10 as outstanding resource waters which will result in a lowering of water quality or impair any use of the navigable waterway in any way."

Chapter 30 Permit Applications

Operators must use Application Form 3500-53 and the *Nonmetallic Mining Permit Application Supplement*. These forms are available from any DNR office.

The application package must also include all of the following.

1. Information about the existing natural (vegetative cover) and physical conditions of the site including 1.) a detailed narrative; 2.) wetland and floodplain maps with project boundaries clearly identified; and 3.) drawings and cross sections of the project site.

Information shown on drawings must be referenced to clearly identified, recoverable bench marks, described and located on the plans. Drawings and maps which are color coded reproduce poorly and are not acceptable. Use symbols and a black ink pen or black felt tip pen that does not bleed through the paper. If drawings or maps are larger than 8½" by 11", six sets must be submitted.

The following points must be addressed:

- a. Soil and geologic composition of the project site (borings should be required during the early preplanning stages to identify the type of material and size of the deposit);
- b. Locations, dimensions and elevations of surface waters;
- c. The elevation of ground water throughout the project site;
- d. Cross sections of the entire floodplain of any streams. A hydrologic and hydraulic analysis may also be required to demonstrate compliance with NR 116. Net changes in ground contours in the floodway of a stream that may cause an increase in the 100 year flood elevation, including temporary stockpiling, require that the operator submit a hydraulic analysis if the operation exceeds five acres or has an estimated cost exceeding \$125,000. Such changes may also require other action such as amending a flood profile or securing flooding easements to comply with ch. NR 116 or a local floodplain zoning ordinance;
- e. Location and description of manmade features on the site;
- f. Detailed plans and narrative descriptions of the nature and extent (dimensions) of any existing excavations, and the dimensions and quantities of stockpiled materials, topsoil and refuse on the site. The location of both temporary and permanent haulageways (roads) should be shown; including their length, width, side slopes, and elevations;
- g. Historical and archaeological features, if known;
- h. Existing drainage patterns; and
- i. Existing topography. Plans of the site should have a contour interval of 2 feet or less if ground elevations will change and 5 feet or less if ground elevations will not change. A wider contour interval may be approved in areas of steep topography;

2. A legal description of all land within the project boundary that the applicant owns, leases or has an option to purchase or lease. Copies of deeds, options to purchase, and lease agreements must be submitted with the application.
3. Evidence that the applicant has applied for or obtained all necessary local, state, and federal permits and licenses.
4. A statement explaining what the excavated material will be used for (e.g. road construction, asphalt, ready mix, cement blocks, cement pipe, etc.).
5. A description of any investigation conducted to identify alternative upland sites, efforts made to obtain the material, and the estimated volume and quantity of material to be extracted, accompanied by adequate documentation for the basis of the estimates.
6. For connected enlargements and grading projects, applications must include the name and address of the secretary of any property owners' association pertaining to the bodies of water affected or, if there is no such association, at least 5 persons who own real property located adjacent to the bodies of water. If fewer than 5 persons own real property adjacent to the bodies of water, the names and addresses of such persons that own real estate so located shall be given.
7. The complete Operation and Reclamation Plan described below.
8. Other information as required by the Department of Natural Resources in order to make a decision.

Operation and Reclamation Plan

As part of the application package, the operator must provide a detailed schedule and plan describing areas of excavation to be completed each year and work to be performed for each sequential stage of staged operations over the life of the permit.

Include narrative and drawings to clearly describe all of the following.

1. The location, extent (dimensions), depth and manner of operation anticipated. If your project is a staged operation, describe for each stage.
2. The proposed means of loading and transporting material.
3. The estimated volume in cubic yards of material to be extracted and/or stockpiled. Document the basis for the estimates.
4. The final configuration of the nonmetallic mining site including the depths of the excavation; and the location, extent (size) and types of stockpiled materials.
5. Plans to dispose of refuse created on the site throughout the life of the project.
6. The location, removal (time frame), stockpiling (cubic yards) and protection (erosion control) of all

materials in conformance with the local floodplain zoning ordinance and NR 116.

7. Measures to screen the operation from view considering the general shoreland zoning requirements of NR 115.05(3)(c) and the need for buffer zones of sufficient width to prevent environmental pollution.
8. Grading, and stabilization of the site.
9. Measures for diversion and drainage of both ground and surface water from the site where necessary to protect these waters from pollution (include details about erosion control measures such as sediment basins, wash water ponds, sediment screens, silt fences, straw or rock check dams, grass waterways, etc.).
10. Stabilization of the project site, including plans for topsoil grading and application. Include measures to be employed for erosion, drainage control and revegetation. Plans must outline both temporary and final stabilization measures. A diverse, self-regenerative species mixture should be used where consistent with final reclamation. A list of the species for both seed mixtures and woody vegetation to be planted should be provided. Sources of information on stabilization, erosion control and seed mixtures include:
 - a. The Department of Natural Resource publication entitled *Wisconsin Construction Site Best Management Practice Handbook*, with listings for slope and soil type;
 - b. The WI Department of Transportation *Standard Specifications for Road and Bridge Construction*, with minimum seeding requirements for disturbed earth and right-of-ways;
 - c. Soil Conservation Service *Critical Area Planting Guidelines*, with listings for slope and soil types.

The operator may submit alternate seeding mixtures and stabilization techniques designed to achieve stabilization of the site if it can be shown that the methods of the agencies listed above are not appropriate for all conditions encountered.

Revegetation is not necessarily limited to planting of a grass cover; the Department may require woody vegetation (trees and shrubs) in the reclamation plan to offset habitat losses.

11. Floodplain excavation where fish entrapment would occur should include a design for an impoundment of water (ponds) of sufficient quality, permanency, size, and stable slopes or banks to benefit public use and avoid fish kills.
12. A marked, easily usable public access from the waterway is required for ponds constructed in the floodplain because of fish entrapment. Documentation of a legal, recordable, dedicated access must be submitted with the application.
13. An acknowledgement of continued responsibility for restoration and revegetation of the project site until stabilization has been determined to be adequate by the Department. (This acknowledgement is found within the *Nonmetallic Mining Permit Application Supplement*).

14. Estimated cost for progressive, temporary, and final reclamation of the entire nonmetallic mining site.
15. An estimate of total reclamation costs. Use the Reclamation Costs Estimate form which is part of the *Nonmetallic Mining Permit Application Supplement* or provide complete information on a separate sheet. This information is needed for an environmental analysis and to determine whether the operator must submit a hydraulic analysis as specified in NR 116. These costs will be only a portion of the total project costs.
16. Other information as needed by the Department in order to make a decision.

NOTE: Unless reflected in the schedule, cessation of project operations for more than 180 consecutive days is an abandonment of operations [see NR 340.02(1)].

Bonding

Bonding is required for each site over one acre and multiple sites of less than one acre by the same operator. Governmental units are not required to obtain bonds.

1. Determination and Notification - The bonding level for reclamation or progressive reclamation in staged operations must be the larger amount of either \$2,000 per acre or \$0.25 per cubic yard of material excavated *based on 1989 dollars* unless the operator justifies a lesser amount to the Department's satisfaction.

The base of 1989 dollars requires that the bonding level must be adjusted to reflect inflation or the cost of living increases. For 1992, the inflation of 4.6 % for 1989, 6.1% for 1990 and 3.1% for 1991, or a total of 14% ($1.046 \times 1.061 \times 1.031 = 1.144$) must be added to the listed rates resulting in amounts of \$ 2280 per acre or \$ 0.285 per cubic yard. For permits issued after 1992, remember to correct for cost of living adjustments for all years back to 1989.

The Department of Natural Resources must determine the required bonding level for all operations and notify the operator. Following approval of the permit, and as a condition of the permit, the operator must file a bond with the Department. The bond amount shall be sufficient to cover the cost to the State of hiring a contractor to complete reclamation or progressive reclamation in staged operations.

2. Filing - Upon notification of required bonding levels by the Department, but prior to commencing the project, the operator shall file with the Department a bond conditioned on faithful performance of all requirements of Ch. 30, all provisions of NR 340 and all provisions of the permit. The operator may start operation and reclamation activities only after notification by Department staff that the bond submitted meets NR 340 requirements.
3. Requirements - Bonds must be issued by a surety company licensed to do business in this state. At the option of the operator, a performance bond or a forfeiture bond may be filed. Surety companies may complete the reclamation plan in lieu of cash payment to the Department.

The bond must provide that it is not cancelable by the surety, except after not less than 90 days notice to the Department in writing by registered or certified mail. The bond must be payable to the

"State of Wisconsin, Department of Natural Resources". Not less than 30 days prior to the expiration of the 90-day notice of cancellation, the operator must deliver to the Department a replacement bond. If no replacement bond is provided the existing bond must remain in effect.

Bonds should be issued on a non-cancelable form. A bond may not be cancelled until a replacement bond has been approved or the project has been closed out after a final inspection. Bonds must be kept current.

4. Bond Alternatives - Upon written approval of the Department, an operator may deposit cash, certificates of deposit or government securities with the Department in lieu of a bond. Interest received on certificates of deposit or government securities will be paid to the operator. Certificates of deposit must be automatically renewable or other assurances shall be provided before the maturity date. Any securities must be made payable to the "State of Wisconsin, Department of Natural Resources."
5. Bond Reevaluation - The Department may reevaluate and adjust the amount of the progressive reclamation bond or security deposit required for reclamation. Reclaimed areas may be released from the bond coverage. Reevaluation will be made pursuant to NR 340.055(1) and (2).
6. Multiple Project Permit Bonding - Any operator who obtains a permit from the Department for two or more sites may elect, at the time a second site is approved, to post a single bond in lieu of separate bonds on each site. Any single bond so posted must be in an amount equal to the estimated cost to the State for reclamation as stated in each permit. When an operator elects to post a single bond in lieu of separate bonds previously posted on individual sites, a separate bond may not be released until the new bond has been accepted by the department.
7. Bond Release - The Department will release the operator's bond after inspection of the project site shows completed reclamation of the project site in accordance with the operation and reclamation plans. The entire project site must be adequately revegetated and stable before the bond can be released. Final inspection must be made not less than one year, nor more than two years after the completion of the project, including reclamation.
8. Abandoned Sites - Bonds for any site abandoned at the time a permit expires will not be released unless it is shown that no operations have occurred at that site and no potential for environmental pollution exists as a result of an operator's actions or inactions.

Permit Modifications

1. At any time prior to expiration of a permit, an operator may apply for an amendment or cancellation of a project permit or for a change in the reclamation plan for a site.

The application for the amendment, cancellation or change should be submitted by the operator on a form provided by the Department. The application should identify any tract of land to be added to or removed from the permitted site, or to be affected by a change in the operation and reclamation plan. Any increase in the size of the site shall be subject to the notice and potential hearing requirement of s. 30.02.

2. When one operator succeeds to the interests of another in any uncompleted operation, the Department will release the first operator from the responsibilities imposed by chapter 30 only if:
 - a) both operators are in compliance with the requirements and standards of the chapter and NR 340;
 - b) the new operator assumes the responsibility of the former operator to complete the reclamation; and
 - c) the new operator submits an adequate bond.

Permit Renewals and Extensions

The initial Chapter 30 permit can be issued for a period not greater than 10 years. If no proceeding for revocation or violation of the permit has been initiated during the term of the permit and there are no other changes or previously unknown circumstances, including environmental consideration, the permit may be either renewed or extended if the following considerations are met:

1. A request for a permit renewal or extension must be submitted to the Department in writing prior to the expiration date of the existing permit. Be sure to specify whether you are requesting a 3-year extension or 10-year renewal.
2. No permit renewal or extension may be granted unless the operation is in compliance with the terms of the existing permit.
3. Permit extensions may be granted for up to three years. A permit extension may only be granted one time and only toward the end of a project when permit renewals are no longer needed.
4. Permits may, after a notice and opportunity for hearing, be renewed for succeeding periods of up to 10 years.
5. Permit renewals and extensions may be conditioned upon correction of any unanticipated environmental damage occurring during the original permit.

Inspections and Documentation

Department of Natural Resources staff is required to inspect each nonmetallic mining site at least once annually to ensure that the operation is in conformance with the permit and the operation and reclamation plan. DNR staff writes reports based on these site inspections.

Operators may be required to submit an annual narrative describing the progress of the operation and reclamation.

Violations

An operator found either conducting project operations without the required permits or violating the conditions of a permit will be ordered to cease all operations immediately and submit a reclamation plan for the land already affected. Continued operation and after-the-fact permit approval is prohibited until the reclamation plan has been approved by the Department and necessary progressive reclamation has been completed. Bonds may be called to secure necessary reclamation.

The Department may cancel and rescind the permit of any operator who is in violation of NR 340 and the permit.

SECTION III

Sample Drawings and Illustrations

The following series of figures, taken from the publication, *A Guide to Site Development and Rehabilitation of Pits and Quarries*, Industrial Mineral Report 33, 1970, Ontario Department of Mines, may be valuable to operators developing Chapter 30 and NR 340 applications. Note that the illustrations do not contain all information required for an application.

Illustrations of temporary and final erosion control techniques can be found in the Wisconsin Department of Natural Resources handbook, *Wisconsin Construction Site Best Management Practice Handbook*.

Copies of the handbook may be purchased through:

Document Sales
202 S. Thornton Avenue
P.O. Box 7840
Madison, WI 53707

Orders must be prepaid by cash, money order or check, payable to Department of Administration. Call to determine cost: 608/266-3358. Telephone orders cannot be accepted.

[15 pages of figures here]

SECTION IV

Glossary and Contacts List

Glossary

Abandonment of operations means the cessation of nonmetallic mining operations for more than 180 consecutive days where the cessation is not specifically set forth in an operator's application and permit, or by other written request. Abandonment of operations does not include the cessation of activities due to labor strikes or natural disasters.

Bank means the land surface abutting the bed of any navigable waterway which, either prior to any project or alteration of land contours or as a result of the proposed project or alteration, slopes or drains without complete interruption into the water body [as defined in NR 340.02 (2)].

Buffer zone means an undisturbed strip of land which may require additional planting of trees or shrubs to screen the operations from view or act as a sediment trap along waterways, property lines, and roads or highways.

Navigable streams have a bed and banks and can float a canoe or other small craft at some time of the year—even if only during spring floods. Refer to DNR Publication 5-3500(82) "Public or Private? I - Navigability".

Nonmetallic mining refuse or "refuse" means all waste soil, rock, mineral, liquid, vegetation and other material resulting from an operation. Refuse does not include merchantable by-products directly resulting from or displaced by the operation.

A nonmetallic mining site is the area disturbed by an operation, including the surface area from which material has been or will be removed, the surface area covered by or to be covered by refuse and mineral stockpiles, and land disturbed or to be disturbed by the construction or improvement of haulageways.

The Ordinary High-water Mark (OHWM) is the point on the bank or shore where the water is present often enough to leave a distinct wear mark. More specifically, the OHWM is the point on the bank or shore up to which the water, by its presence and action or flow, leaves a distinct mark indicated by erosion, destruction of or change in vegetation or other easily recognizable characteristics. Refer to DNR Publication 6-3500(82) "Public or Private? II - The Ordinary High-water Mark". If you have further questions, please contact the DNR Water Management Specialist serving your area.

Reasonable alternatives means the use of a substitute upland site having similar material or, where substitute sites are unavailable, modifying the operation plan or reclamation plan to minimize impacts to or stabilize the streambed and banks where the objectives of the operator can still be substantially met.

Reclamation means the rehabilitation of the nonmetallic mining site including, but not limited to, establishment of adequate vegetative cover, stabilization of soil conditions, prevention of environmental pollution and restoration of fish, plant and wildlife habitat.

Shorelands are areas zoned within 1000 feet of a lake's Ordinary High-water Mark, and within 300 feet of all navigable streams or the outer edge of the floodplain, whichever distance is greater.

Zoning and DNR Offices By County

COUNTY	ZONING OFFICE	DNR OFFICE	COUNTY	ZONING OFFICE	DNR OFFICE
Adams	608-339-4222	715-421-7815	Marathon	715-847-5307	715-627-4317
Ashland	715-682-7014	715-372-4866	Marinette	715-735-7532	715-732-0101
Barron	715-537-6375	715-822-3590	Marquette	608-297-9125	414-485-3009
Bayfield	715-373-6138	715-372-4866	Menominee	715-799-3313	715-732-0101
Brown	414-436-3266	414-448-5142	Milwaukee	Call city halls	414-263-8679
Buffalo	608-685-3780	715-284-1424	Monroe	608-269-8738	608-785-9010
Burnett	715-349-2138	715-822-3590	Oconto	414-834-5322	715-732-0101
Calumet	414-849-2361	414-448-5142	Oneida	715-369-6130	715-358-9214
Chippewa	715-723-1831	715-839-3769	Outagamie	414-832-5255	414-424-4003
Clark	715-743-3241	715-284-1424	Ozaukee	414-284-9411	414-263-8682
Columbia	608-742-2191	414-485-3009	Pepin	715-672-8897	715-839-3769
Crawford	608-326-0294	608-785-9010	Pierce	715-273-3531	715-839-3769
Dane	608-266-9083	608-273-5970	Polk	715-485-3161	715-822-3590
Dodge	414-368-4411	414-485-3009	Portage	715-346-1334	715-421-7815
Door	414-743-5511	414-448-5142	Price	715-339-3272	715-762-3204
Douglas	715-394-0380	715-372-4866	Racine	414-886-8470	414-263-8682
Dunn	715-232-1401	715-839-3769	Richland	608-647-2447	608-935-3368
Eau Claire	715-839-4741	715-839-3769	Rock	608-755-2087	608-273-5970
Florence	715-528-4251	715-732-0101	Rusk	715-532-2156	715-762-3204
Fond du Lac	414-929-3139	414-485-3009	St. Croix	715-386-4680	715-839-3769
Forest	715-478-3893	715-358-9214	Sauk	608-356-5581	608-935-3368
Grant	608-723-2848	608-935-3368	Sawyer	715-634-8288	715-762-3204
Green	608-328-9423	608-273-5970	Shawano	715-526-6766	715-732-0101
Green Lake	414-294-4027	414-485-3009	Sheboygan	414-459-3060	414-263-8682
Iowa	608-935-5077	608-935-3368	Taylor	715-748-3131	715-762-3204
Iron	715-561-5414	715-372-4866	Trempealeau	715-538-2311	715-284-1424
Jackson	715-284-0220	715-284-1424	Vernon	608-637-7081	608-785-9010
Jefferson	414-674-2500	608-273-5970	Vilas	715-479-3620	715-358-9214
Juneau	608-847-9391	715-421-7815	Walworth	414-741-3394	414-263-8678
Kenosha	414-656-6550	414-263-8682	Washburn	715-468-2666	715-822-3590
Kewaunee	414-388-4410	414-448-5142	Washington	414-335-4445	414-263-8678
La Crosse	608-785-9722	608-785-9010	Waukesha	414-548-7790	414-263-8680
Lafayette	608-776-4820	608-935-3368	Waupaca	715-258-6255	414-424-4003
Langlade	715-627-6206	715-627-4317	Waushara	414-787-4631	414-424-4003
Lincoln	715-536-0333	715-627-4317	Winnebago	414-236-4844	414-424-4003
Manitowoc	414-683-4185	414-448-5142	Wood	715-421-8466	715-421-7815

-
- **In cities and villages, contact the municipal zoning administrator, building inspector, or clerk and the DNR office for the county in which the municipality is located.**

BOND FORM

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES
ATTN: AREA WATER MANAGEMENT SPEC.

PERFORMANCE BOND FOR NONMETALLIC
MINERAL MINING PERMIT X

X Name, address
X, WISCONSIN, X

KNOW ALL MEN BY THESE PRESENTS:

That _____,
(Name) (Address)

of _____, _____, as Principal,
(City) (State & Zip Code)

and _____,
(Name of Surety Company) (Address)

a surety company organized and existing under the laws of the State of _____
and duly organized to do surety business in the State of Wisconsin, as Surety, are held and firmly bound
unto the State of Wisconsin, Department of Natural Resources, as obligee, in the penal sum of X dollars
(\$X), lawful money of the United States, for payment of which the Principal and Surety bind themselves,
their heirs, executors, administrators, successors and assigns, jointly and severally, by these presents.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, That whereas, the said Principal has been
authorized to mine nonmetallic minerals under permit X from a project site adjacent to the X Waterway,
located in Section X, Township X North, Range X East, X Village/ City/ Town of X, X County,
Wisconsin, and the project is subject to the requirements of Chapter 30, Wisconsin Statutes, and NR 340,
Wisconsin Administrative Code.

WHEREAS, Chapter NR 340 requires that the Principal provide the Obligee with a bond to ensure that
permit X or any amendments thereto will be completed as approved.

WHEREAS, this performance bond is written to provide proof of financial responsibility to complete
permit X or any amendments pursuant to Chapter NR 340 and shall inure to the benefit of the Obligee.

Now, Therefore, the condition of this obligation is such that if the Principal or any successor in interest
complies with the requirements of permit X and any amendments thereto and completes the project in
accordance with these requirements then, and only then, this obligation shall be void; otherwise, it shall
remain in full force and effect.

All or any part of this bond may be withdrawn by the Obligee, upon written request by the Secretary of the
Obligee, to be used to carry out the requirements of permit X and any amendments thereto if the Principal
or any successor in interest fails to do so.

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES
ATTN: AREA WATER MANAGEMENT SPEC.

PERFORMANCE BOND FOR NONMETALLIC
EXCAVATION PERMIT X

X Name address
X, WISCONSIN, X

The liability of the Surety shall not be discharged by any payment or succession hereunder, unless and until such payment or payments shall amount in the aggregate to the full penal sum of this bond, but in no event shall the obligation of the Surety thereunder exceed the full penal sum of this bond.

Release or discharge of the Surety shall not release the Principal or any successor in interest from the obligation to fully and completely comply with all requirements of permit X and any amendments thereto. The insolvency or bankruptcy of the Principal shall not constitute a defense to the Surety with regard to any claim of liability on the obligation of this bond. No amendment to permit X will release the Surety from its obligation under this bond.

The Surety hereby waives notification of any failure on the part of the Principal or any successor in interest to faithfully comply with the terms of permit X or any amendments thereof and lack of notice from the Obligee will not bar or limit recovery against the Surety.

This bond is effective on the _____ day of _____, 20____, and shall continue in force for 2 (two) years after completion of permit or any amendments. As long as any obligation of the owner or any successor in interest for compliance with permit or any amendments thereto exists, this bond shall not be cancelled by the Surety unless a replacement bond or other proof of financial responsibility acceptable to the Obligee is provided to the Obligee.

If the Surety proposes to cancel this bond, notice shall be provided to the Obligee and the Principal in writing by registered or certified mail not less than 90 days prior to the proposed cancellation date.

Not less than 30 days prior to the expiration of the 90-day notice period, the principal shall deliver to the Obligee a replacement bond or other proof of financial responsibility under permit X, any amendments and Chapter NR 340, Wis. Administrative Code.

In the absence of the delivery of a replacement bond or other acceptable proof of financial responsibility, all site or facility operations shall immediately cease and this bond shall remain in full force and effect as long as any obligation of the Principal or any successor in interest for compliance with permit X or any amendments thereto.

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES
ATTN: AREA WATER MANAGEMENT SPEC.

PERFORMANCE BOND FOR NONMETALLIC
EXCAVATION PERMIT X

X Name, address
X, WISCONSIN, X

Signed, sealed and dated this the _____ day of _____, 20____.

PRINCIPAL

SURETY

ATTORNEY-IN-FACT

BOND NUMBER _____

BOND APPROVAL LETTER

Date

File X

X address

Dear Mr. X:

Your \$ X.00 performance bond No. X for permit X to excavate X and while creating a pond within 500 feet of X, or grade in excess of 10,000 square feet on the bank of X, Town of X in X County is approved. You may (start or resume) excavation under this permit.

Should you have any questions, please call me at X.

Sincerely,
X District

X Area Water Management Specialist

cc: X
X Area Office
X, Conservation Warden,
X, County Zoning Administrator

DECLARATION OF RESTRICTIVE COVENANT

The undersigned, _____ and _____ (spouse) (Owners), hereby declare:

1. They are the record owners of the following described lands, to-wit:

The _____ Quarter of the _____ Quarter (____¹/₄ ____¹/₄)
of Section _____ (____), Township _____ (____)
North, Range _____ (____) East.

2. Said lands are subject to excavation and removal of gravel and other material therefrom; following such excavation, _____ will construct certain proposed ponds on said premises;
3. Said resultant ponds will be in the vicinity of the _____ River which flows across the said _____ Quarter of the _____ Quarter (____¹/₄ ____¹/₄) of Section _____ (____), Township _____ (____) North, Range _____ (____) East;
4. _____ has applied to the Department of Natural Resources for necessary permits for excavation and pond construction in said areas and a condition thereof is the granting of public fishing access, on foot, from the said _____ River to the said proposed ponds, upon completion thereof;
5. The said excavation and pond construction will be to the benefit of the undersigned owners;
6. In consideration of the aforesaid benefits by issuance and obtaining of the said permits, the undersigned owners do hereby declare the following as a restrictive covenant on the lands described, to run with the lands, to-wit:

An easement is granted to the public, for pedestrian access only for fishing, extending from the _____ River as it flows through the _____ Quarter of the _____ Quarter (____¹/₄ ____¹/₄), Section _____ (____), Township _____ (____) North, Range _____ (____) East over and across said _____¹/₄ _____¹/₄, Section _____ (____), T____N, R____E to those ponds hereafter constructed upon those lands by _____, said access easement to become effective upon completion of such pond construction.

IN WITNESS WHEREOF, we have hereunto set our hands and seals this _____ day of

_____, _____.
(month) (year)

(Name)

(Name)

State of Wisconsin

) ss.

County of _____)

Personally come before me this _____ day of August, A.D., 19____, the

above-named _____, and

_____ to me known to be the persons who executed the foregoing instrument and acknowledged the same.

Notary Public, _____ County, Wis.

My commission expires: _____

NONMETALLIC MINING SITE INSPECTION RECORD

Permit _____ General file: _____

Permittee: _____ Present: Yes _____ No _____

Location: _____ 1/4 of the _____ 1/4, Section _____, T _____ N, R _____ E,

Waterway: _____ County: _____
=====

Has the excavation of material started? Yes _____ No _____

If yes, what type of excavation was done? Pond _____, Grading _____, Dredging _____.
=====

Was a permit issued for a pond excavation? Yes _____ No _____ N/A _____.

Has groundwater been exposed? Yes _____ No _____ Comment: _____
_____.

Depth of exposed water is approximately _____ feet.

Dimensions of the exposed water are _____ feet wide by _____ feet long.
=====

Was a permit issued for grading on the bank? Yes _____ No _____ N/A _____.

Dimensions of the graded area are _____ feet wide by _____ feet long.
=====

Was a permit issued for dredging below the OHWM? Yes _____ No _____ N/A _____.

Dimensions of the dredged area are _____ feet wide by _____ feet long.
=====

Erosion:

Have temporary erosion control measures been taken? Yes ___ No ___.

What type of temporary erosion control measures have been taken?

Silt fence __, Rock check dams __, Straw-bale check dams __, Sod strips __, Mulching __, Settling basins __, Temporary vegetative cover __, Contour ridges __, Other _____.

Is any portion of the project site eroding? Yes ___ No ___.

Are sediments being contained on the project site? Yes ___ No ___

Comments: _____

_____.

Is the site being dewatered? Yes ___ No ___.

What type of dewatering is occurring? Pumping __, Gravity __.

Does it appear that sediment-laden water is leaving the site and entering surface waters? Yes ___ No ___.

Was a WPDES permit issued for dewatering? Yes ___ No ___.

=====

Permit Conditions:

Phasing of plan followed: Yes ___ No ___

Side slopes in compliance: Yes ___ No ___

Excavation is within boundaries: Yes ___ No ___

Topsoil is being salvaged: Yes ___ No ___

Comment: _____

Is salvaged topsoil located in approved area? Yes ___ No ___

If salvaged topsoil is not located in approved area, what is the location?

Is the site revegetated annually? Yes ____ No ____ Comment: _____

Has the buffer zone been encroached upon? Yes ____ No ____.

Comments: _____

The required width for the buffer zone at the point of encroachment: _____ ft.

Are adjacent wetlands being impacted by this project? Yes ____ No ____.

=====

Additional comments: _____

Inspector: _____ Date: _____ 12/01

**Wisconsin Department of Natural Resources
Nonmetallic Mining Permit
Application Supplement**

GENERAL PROJECT INFORMATION

OPERATOR MUST COMPLETE THIS FORM. Please type or print in black ink. Attach comprehensive plans, maps, cross-sections, narrative descriptions, etc. as appropriate. See the *Operator's Guide to Nonmetallic Mining* for detailed information about the application packet requirements. Drawings and maps which are color-coded reproduce poorly and are not acceptable. If maps or drawings are larger than 8½" by 11", six copies must be submitted. Otherwise, submit only the original documents, keeping copies for your files.

<p>If your project is a connected enlargement or grading project, enter the name and address of the secretary of any property owners' association pertaining to the affected waterway. If there is no such association, enter the names and addresses of 5 persons who own real property located adjacent to the waterway. If fewer than 5 persons own real property adjacent to the waterway, enter names and addresses of those persons.</p>
1.
2.
3.
4.
5.
<p>Briefly describe the existing physical and natural conditions of the site, including types of vegetative cover.</p>
<p>Elevation of the bottom of the nonmetallic mineral deposit _____ ft.</p>
<p>Distance from the excavation to the nearest public road?</p>
<p>Distance from the excavation to the nearest residence?</p>
<p>Distance from excavation to nearest navigable water?</p>
<p>What is the datum of benchmarks used for elevation reference?</p>
<p>Is the project site located in the floodplain of a stream? Yes___ No___</p>
<p>Is the project site located in or adjacent to a wetland? Yes___ No___</p>
<p>Describe existing topography (i.e., level, steep hill, gentle slope).</p>
<p>Describe existing land use on project site (i.e., vacant, farming, etc.).</p>
<p>Describe abutting land use.</p>

Describe and show on plans the soil and geologic composition, including topsoil depth, of the project site. Also describe and show the location of boring or test holes taken to identify the type of material and size of the deposit.
Describe and show on plans the location, dimensions, and elevations of surface waters within or adjacent to the project.
Describe and show on plans the elevation of groundwater throughout the project site.
Describe and show on plans the location of manmade features within the site.
Describe and show on plans the nature and extent (dimensions) of any existing excavations, dimensions and quantities of stockpiled materials, topsoil and refuse in the site.
Describe and show on plans the location of both temporary and permanent haulageways (roads) including the length, width, side slopes, and elevations of the roads.
Describe and show on plans any known historical and archaeological features.
Provide a legal description of all land within the site that the applicant owns, leases or has an option to purchase or lease. Copies of deeds, options to purchase, and leases must be attached.
What will the excavated material be used for (e.g. road construction, asphalt, ready mix, cement blocks, cement pipe)?
Describe any investigation conducted to identify upland alternative nonmetallic mining sites. What efforts were made to obtain the material? What was the estimated volume of material to be extracted? Provide adequate documentation for these estimates.

OPERATION PLANS
Proposed depth of excavation (in feet):
Number of acres to be disturbed, including haulageways, processing areas, storage areas, etc.)
Anticipated duration of mining (in years):
Anticipated starting date (month/day/year):
Normal months of operation:
Normal hours of excavation:
Days of the week excavation will usually take place:
Type of machinery to be used:
Will there be gravel washing or crushing operations on the site? Yes ___ No ___
If yes, describe the operation:
If yes, how many cubic yards of gravel will be stockpiled at any one time?

Are any buildings to be constructed on site? Yes _____ No _____

If yes, describe:

(Indicate building locations on attached drawings and maps.)

RECLAMATION PLAN
How will you screen the operation from view along waterways, property lines, roads and highways?
Describe the specific seed mixture, quantities and species you will use.
Describe fertilizer and mulch to be applied:
Will any final slopes be steeper than 3 feet horizontal to 1 foot vertical? Yes__ No__ If yes, explain reasons:
How large an area will be excavated before reclamation begins? _____ (acres, sq. ft.)
Total estimated cost for reclamation of project site: \$_____.00. (Reclamation Costs Estimate form must be attached.) Basis for estimation:

Will an artificial pond be created? Yes ____ No ____

- a. If yes, what will the average depth be? _____
- b. Maximum depth? _____
- c. Size in acres? _____
- d. Will the pond be subject to flooding? Yes ____ No ____
- e. Will any final slopes in the pond be steeper than 3' horizontal to 1' vertical?
Yes ____ No ____

If yes, explain reasons:

OPERATOR INFORMATION	
Operator's name:	
Operator's title:	
Company's name:	
Company address:	
Telephone, with area code (daytime)	
Telephone, with area code (nights)	
<p>I acknowledge my continuing responsibility for restoration and revegetation of the project site until stabilization has been determined adequate by the Department of Natural Resources.</p> <p>Operator's signature:</p>	
Date:	

Reclamation Costs Estimate Complete each blank or enter N/A			
Activity or Purchase	# Acres or N/A	Cost/Acre or N/A	Total Cost
Recontouring			
Spoil bank area, side slopes and floor			
Equipment costs (grader, bulldozer, etc.)			
Recontouring topography of excavated area			
Topsoil (dry vs. wet gravel pit)			
Topsoil and Subsoil			
Topsoil stripping			
Topsoil replacement			
Purchase of additional topsoil			
Respreading and recontouring subsoil			
Equipment cost to spread topsoil			
Miscellaneous grading of spoil piles			
Preparation and Revegetation			
Equipment cost for seedbed preparation (discing, harrowing & related ground work)			
Seed, fertilizer and lime purchase			
Equipment cost for spreading seed, fertilizer and lime			
Mulch purchase and application			
Costs for purchasing and planting shrub and tree seedlings			
Construction of settlement basins, silt fence, filter cloth, rock riprap, etc.			
Cost for stabilization of topsoil storage piles (temporary and final)			

Cost of reseeding, if first seeding fails			
Cost of temporary erosion control measures			
Total Acres Involved in Reclamation			
Total Reclamation Costs			

RELATED PUBLICATIONS

1. "Wildlife Values of Gravel Pits," Miscellaneous Publication 17, 1982. Agriculture Experiment Station, University of Minnesota.
2. "Pit and Quarry Rehabilitation: The State of the Art in Ontario," Ministry of Natural Resources, Ontario, Canada.
3. "A Guide to Site Development and Rehabilitation of Pits and Quarries", Industrial Mineral Report 33, by Anthony Bauer, Ontario Department of Mines, 1970.
4. "Mineral Resources Mining and Land Use Planning in Wisconsin," UWEX, Geological and Natural History Survey, Information Circular, Number 26, 1975.
5. "Sand and Gravel Operations: A Transitional Land Use." 1977. Edited by Kenneth L. Schellie, National Sand and Gravel Association.
6. "A Study of Surface-Mined Areas in Central Wisconsin," River Country Resource Conservation and Development Council. 1981. U.S. Department of Agriculture, Soil Conservation Service, Madison, Wisconsin.
7. "Annual Technical Reports," Plant Materials Center. U.S. Department of Agriculture, Soil Conservation Service, Big Flats, N.Y.
8. "Annual Technical Reports," Plant Materials Center - Midwest States. U.S. Department of Agriculture, Soil Conservation Service, East Lansing, Michigan.
9. "Enhancement of Fish and Wildlife Resources in the Reclamation of Hard Rock Mined Areas in the Upper Midwest," by Barr Engineering Co., John P. Borovksy for the Fish and Wildlife Service, U.S. Department of the Interior, FWS/OBS-80/64, September, 1980.
10. "The River Environment, A Reference Document," prepared for United States Department of the Interior Fish and Wildlife Service by D.B. Simons, et al., Colorado State University, December, 1975.
11. "The Effects of Stream Alteration in Idaho," Richard A. Irizarry, Fishery Biologist, Idaho Fish and Game Department Project F 55-R-2, 1969.
12. "Evaluation of the Effects of Gravel Dredging in a River," Robert J. Kemp, Director of Fisheries, Lonnie J. Peters, Chief, Inland Fisheries, Texas Parks and Wildlife Department, 1975.

13. "The Effects of In-Stream Sand and Gravel Dredging on the Aquatic Life of the Upper Allegheny River," Daniel G. Bardarek, Ph. D. John C. Alden, M.S., Robert L. Shema, B.S. Environmental Sciences Inc.
14. "Warmwater Stream Alteration in Iowa: Extent, Effects on Habitat, Fish and Fish Food and Evaluation of Stream Improvement Structures (Summary Report)," by R. V. Bulkley, et al., Iowa Cooperative Fishery Research Unit, Iowa State University, Ames, Iowa, 1976.
15. "Gravel Removal Studies in Arctic and Subarctic Floodplains in Alaska," Fish and Wildlife Service, U.S. Department of Interior, FWS/OBS-80/08, June, 1980.
16. "Gravel Removal Guidelines Manual for Arctic and Subarctic Floodplains," Fish and Wildlife Service, U.S. Department of Interior, FWS/OBS-80/09, June, 1980.
17. "Soil Genesis, Hydrological Properties, Root Characteristics and Microbial Activity of 1-to 50-Year Old Strip Mine Spoils", Interagency Energy/Environment R&D Program Report, USDA, EPA-600/7-79-100. April, 1979.
18. "Reclamation and Pollution Control: Planning Guide for Small Sand and Gravel Mines," Bureau of Mines, U.S. Department of the Interior, Mineral Environmental Technology, Contract JO 199052, January, 1981.
19. "Woodlands of the Northeast, Erosion and Sediment Control Guides," by USDA, SCS, Northeast Technical Service Center and Forest Service, Northeastern Area State and Private Forestry, 1977.
20. "Erosion and Sediment Control Handbook," Perry Y. Amimoto, Engineering Geologist, Division of Mines and Geology, Department of Conservation, California, May 1981.
21. "Manual of Standards for Erosion and Sediment Control Measures," Association of Bay Area Governments, June 1981.
22. "Erosion and Sediment Control Guidelines for Developing Areas of Sierras," by the High Sierra RC&D Council, November, 1981.
23. "Visual Resource Evaluation Methodology", U.S. Army Engineer District, St. Paul Corps of Engineers. March, 1982.
24. "Shrubs and Vines for Northeastern Wildlife", USDA Forest Service General Technical Report NE-9, 1974.
25. "Seed Crops and Regeneration Problems of 19 Species in Northeastern Wisconsin", by Richard M. Godman and Gilbert A. Mattson, USDA Forest Service Research Paper NC-123, 1976.

26. "Natural Regeneration of Northern Hardwoods in the Northern Great Lakes Region", by Carl H. Tubbs, USDA Forest Service Research Paper NC-152, 1977.
27. "The Status of Land Disturbed by Surface Mining in the United States", Basic Statistics by State and County as of July 1, 1977, United States Department of Agriculture, Soil Conservation Service, SCS-TP-158.
28. "A Guide To: Conservation Plantings on critical Erosion Areas", Soil Conservation Service, U.S. Department of Agriculture, March, 1980.
29. "State-of-the-Art", Sand and Gravel Industry, Environmental Protection Technology Series, National Environmental Research Center, Office of Research and Development, USEPA Corvallis, OR. EPA-660/2-74-066, June, 1974.
30. "Nonconsumptive Use of Wildlife in the United States", US Department of Interior, Fish and Wildlife Services, Resource Publication 154, 1984.
31. "Evaluation of Constructed Ponds, A Means of Replacing Natural Wetland Habitat Affected by Highway Projects in North Dakota", by Richard Crawford and Judith Rossiter, Department of Biology, University of North Dakota, Grand Forks, ND., State Study (2)-79(A), March, 1981.
32. Atlas of Coal/Minerals and Important Resource Problem Areas for Fish and Wildlife in the Conterminous United States, FWS-OBS-81/06, July, 1981.
33. "Procedures for Assessment of Cumulative Impacts of Surface Mining on the Hydrologic Balance", US Geological Survey Open-File Report 82-334 by Alan M. Lumb, 1982.
34. "Annual Technical Report", Big Flats Plant Material Center, USDA - SCS, Big Flats, N.Y., 1980-1981.
35. "Acute Effects of Silt and Sand Sedimentation on Freshwater Mussels", by Leif L. Marking and Terry D. Bills, U.S. Fish and Wildlife Service, Fish Control Laboratory, LaCrosse, WI NCS-SA-77-104-CO, December, 1977.
36. "The Effects of Cyclic Exposure to Suspended Solids and Turbulence in Two Species of Freshwater Mussels", by David W. Aldridge, Department of Biology, North Carolina, A&T State University, July, 1983.
37. "The Effect of Gravel Dredging on Reservoir Primary Production, Invertebrate Production, and Mussel Production", by Tennessee Wildlife Resources Agency, Nashville, and the National Marine Fisheries Service, Washington, D.C., August, 1976.

38. "The Effect of Gravel Dredging on Mussel Production", by Paul Yokley, Jr., American Bulletin of the Malacological Union, Inc., 1976.
39. "Revegetation Research on Surface-Mined Land in Eastern Kentucky, W.G. Vogel, Northeastern Forest Experiment Station, Forest Service, USDA, Berea, Kentucky, 1978.
40. "There's More to Reclamation Than Planting Trees", John R. McGuire, Chief, Forest Service, USDA, Washington, D.C., 1977.
41. "Hybrid Poplar Pulpwood and Lumber from a Reclaimed Strip-Mine", Walter H. Davidson, Northeastern Forest Experiment Station, Broomall, PA., 1979.
42. "Results of Tree and Shrub Plantings on Low pH Strip-Mine Banks", Walter H. Davidson, Northeastern Forest Experiment Station, Broomall, PA, 1979.
43. "A Survey of Bird Use of Strip-Mined Areas in Southern West Virginia", H.S. Crawford, et al., Northeastern Forest Experiment Station, USDA Building, Orono, Maine.
44. "Natural Revegetation of Iron Mining Overburden", John P. Borovsky, U.W. Stevens Point, Mineral Waste Stabilization Liaison Committee, Eveleth, MN, 1979.
45. "Birch Species Survive Well on Problem Coal Mine Spoils", W.H. Davidson, Proceedings, 24th Northeastern Forest Tree Improvement Conference, University of Maryland, College Park, Maryland, 1976.
46. "Landscape Plants for North Central Wisconsin", T.J. Wilson, U.W. Extension Resource Agent, Wausau, WI 1977.
47. "Trees for Reclamation", Symposium Proceedings, General Technical Report NE 61, Lexington, Kentucky, 1980.
48. "Evaluation of Selective Erosion Control Techniques - Piedmont Region of SE United States, United States Environmental Protection Agency, EPA-600/2-79-124, Municipal Environmental Research Laboratory, Cincinnati, OH, 1979.
49. "Breeding Birds of an Abandoned Gravel Pit in Northwest Minnesota", W.D., Svedarsky, T.A. Feiro and D. Sandstrom, The Loon Vol. 55, 1983.
50. "Trees for Reclamation", Leaflet Series, State and Private Forestry, USDA Forest Service, Berea, Kentucky, 1980.
51. "Characterization of Glacial Overburden Waste and Red Ore Tailings of the Mesabi Iron Range, Minnesota", Symposium on Surface Mining Hydrology, Sedimentology and Reclamation, J.P.

Borovsky, et al., Lexington, Kentucky, 1982.

52. "Surface Mining and Fish/Wildlife Needs in the Eastern United States", Proceedings of a Symposium, West Virginia University Fish and Wildlife Service, FWS-OBS-78/81 A, US Dept. of the Interior, 1979.
53. "Geochemical Factors Affecting Plant Growth in Reclamation", W.C. Ashby, et al., 1979.
54. "Revegetation Equipment Catalog", Prepared for the Vegetative Rehabilitation and Equipment Workshop, John E. Larson, USDA Forest Service, Equipment Development Center, Fort Missoula, Missoula, Montana, 1980.
55. "Land Reclamation Program", Operated for US Department of Energy, ANL/LRP-12, Contract W-31-109-ENG-38, Argonne National Laboratory, Argonne, IL, 1980.
56. "Seeding and Planting to Achieve Land Management Objectives", W.T., Plass.
57. "Red Pine in the North Central States", A Manager's Handbook, General Technical Report NC-33, USDA Forest Service, North Central Forest Experiment Station, St. Paul, MN, 1977.
58. "Northern Hardwoods in the North Central States", A Manager's Handbook, General Technical Report NC-39, USDA Forest Service, North Central Forest Experiment Station, St. Paul, MN, 1977.
59. "Aspen in the North Central States", A Manager's Handbook, General Technical Report NC-36, USDA Forest Service, North Central Forest Experiment Station, St. Paul, MN, 1977.
60. "Natural Regeneration of Northern Hardwoods in the Northern Great Lakes Region", USDA Forest Service Research Paper NC-150, C.H. Tubbs, North Central Forest Experiment Station, St. Paul, MN, 1977.
61. "Regeneration and Productivity of Aspen Grown on Repeated Short Rotation", USDA Forest Service Research Paper NC-176, D.A. Perala, North Central Forest Experiment Station, St. Paul, MN, 1979.
62. "Site Preparation for Jack Pine of Grayling Sands", Research Note NC-138, J.H. Cooley, North Central Forest Experiment Station, USDA Forest Service, St. Paul, MN, 1972.
63. "Worked-Out Gravel Land: A Challenge and an Opportunity by Timothy U. Hartwright, Middlesex England, 1974
64. "Aspen Sucker Production and Growth from Outplanted Root Cuttings", Research Note NC-241, D.A. Perala, USDA Forest Service, North Central Forest Experiment Station, St. Paul, MN, 1978.

65. "Sludge-Treated Coal Mine Spoils Increase Heavy Metals in Cover Crops", Research Note NC-221, USDA Forest Service, North Central Forest Experiment Station, St. Paul, MN, 1977.
66. "Proceedings of the West Virginia Academy of Science", Volume 51 - No. 3, Symposium on Strip-Mine Reclamation, 1979.
67. "Avoid Problem Spoils Through Overburden Analysis", General Technical Report NE-10, T.L. Despard, USDA Forest Service, Northeastern Forest Experiment Station, Upper Darby, PA, 1974.
68. "Methods for the Assessment and Prediction of Mineral Mining Impacts on Aquatic Communities", A Review and Analysis Workshop Proceedings, FWS/OBS-78/30, Fish and Wildlife Service, US Dept. of Interior, 1978.
69. "Standard Specifications for Road and Bridge Construction", State of Wisconsin, Department of Transportation, 1981 Edition.
70. "Minimizing Erosion in Urbanizing Areas", Guidelines, Standards and Specifications, USDA - SCS, Madison, WI 1972.
71. "Trees & Shrubs for the Improvement and Rehabilitation of Pits and Quarries in Ontario", Ministry of Natural Resources, Mineral Resources Branch, Ontario, 1979.
72. "Comparison of Reclamation Costs Under North Dakota and Federal 1977 Reclamation Laws", Inter-agency Energy-Environmental Research and Development Program Report SEA/CR IAG No. 684-15-21, D. Gronhovd, et al., US EPA, Cincinnati, OH.
73. "Mitigation and Enhancement Techniques for the Upper Mississippi River System and Other Large River Systems", Resource Publication 149, Fish and Wildlife Service, U.S. Department of Interior, 1982.
74. "Surface Mining of Non-Coal Minerals", A Study of Mineral Mining from the Perspective of the Surface Mining Control and Reclamation Act of 1977, National Academy of Sciences, Washington, D.C., 1979.
75. "Surface Mining of Non-Coal Mineral, Appendix I: Sand and Gravel Mining, and Quarrying and Blasting for Crushed Stone and Other Construction Minerals", National Academy of Sciences, Washington D.C., 1980.
76. "Surface Mining and Our Environment", A Special Report to the Nation, U.S. Department of the Interior, 1965.
77. "Stream Alterations: An Introduction to National Water Resources Analysis Group", Eastern Energy and Land Use Team, USFWS, May, 1981.

78. "Impacts of Water Level Changes on Woody Riparian and Wetland Communities, Volume I, Plant and Soil Responses", FWS/OBS-77/58, December, 1977.
79. "Impacts of Water Level Changes on Woody Riparian and Wetland Communities, Volume IV Eastern Deciduous Forest Region", FWS/OBS-78/87, September 1978.
80. "Impacts of Water Level Changes on Woody Riparian and Wetland Communities, Volume V, Northern Forest Region", FWS/OBS-78/88, September, 1978.
81. "Responses of Submersed Vascular Plant Communities to Environmental Change", Summary, FWS/OBS-79/83, August, 1980.
82. "Responses of Submersed Vascular Plant Communities to Environmental Change", FWS/OBS-79/83, August, 1980.
83. "Impact Assessment of Water Resource Development Activities. A Dual Matrix Approach", FWS/OBS-78/82, September, 1978.
84. "Floral and Faunal Changes in Lowland Hardwood Forests in Missouri Resulting from Channelization, Drainage and Impoundment", FWS/OBS-78/91, January, 1979.
85. "Impact of Stream Alterations on Riparian Communities in South Central Oklahoma", FWS/OBS-80/17. August, 1980.
86. "Low Flow Hydraulics in Alluvial Channels", by Barbara A. Miller and Harry G. Wenzel, Dept. of Civil Eng. University of Illinois at Urbana-Champaign Water Resources Center, for U.S. Dept. of the Interior, Washington, D.C., September, 1984.
87. "Some Effects of Stream Channelization of Fish Populations, Macroinvertebrates and Fishing in Ohio and Indiana", by FWS/OBS-77/46, July, 1978.
88. "Relation of Physical and Mineralogical Properties to Streambank Stability", Water Resources Bulletin, American Water Resources Association, Vol. 9, No. 1 by Don W. Goss, February 1973.
89. "A Primer on Floodplain Dynamics", Journal of Soil and Water Conservation, by Thomas Maddock Jr., March-April, 1976.
90. "Superabsorbents a New Tool for Land Reclamation", An Introduction to a Valuable Technology, by James F. Pretchard, 1985.
91. "Techniques to Reduce the Sediment Resuspension Caused by Dredging", by Gene L. Raymond,

Environmental Laboratory, U.S. Army Corps of Engineers, Misc. Paper HL-84-3, September, 1984.

92. "Mineral Facts and Problems", Chapter on Sand and Gravel by Valentin V. Tepordei, Bureau of Mines Bulletin 671, U.S. Department of the Interior, 1980 Edition.
93. "Submerged Vanes for Flow Control and Bank Protection in Streams", by A. Jacob Odgaard and Hong-Yuan E. Lee, IIHR Report No. 279, Iowa Institute of Hydraulic Research, The University of Iowa, Iowa City, Iowa, July, 1984.
94. "An Evaluation of Wisconsin's Construction Erosion and Stormwater Runoff Control Programs", by WDNR and Wisconsin Department of Agriculture, February, 1984.
95. "The Potential Effects of Clearing and Snagging on Stream Ecosystems", FWS/OBS-78/14, by F.W.S., U.S. Department of the Interior, January, 1978.
96. "Effects of Stream Channelization on Aquatic Macroinvertebrates, Buena Vista Marsh, Portage County, Wisconsin, FWS/OBS-78-92, June, 1978.
97. "Effects of Stream Channelization on Terrestrial Wildlife and Their Habitats in Buena Vista Marsh, Wisconsin FWS/OBS-76/25, December, 1976.
98. "An Overview of Major Wetland Functions and Values", FWS/OBS-84-18, September, 1984.
99. "Manual of Stream Channelization Impacts on Fish and Wildlife", FWS/OBS-82/24, Fish and Wildlife Service, U.S. Department of Interior, July, 1982.
100. "Management of Floodplain Sand and Gravel Mining", by Joann Mossa, Louisiana, Geological Survey, Proceedings of the Ninth Annual Conference of the Association of State Floodplain Managers, April, 1985.
101. "Can Mined Land be Made Better Than Before Mining?", by the Land Reclamation Research Center, the North Dakota Mining and Mineral Resources Research Institute and the North Dakota Mining and Mineral Resources Research Institute and the North Dakota Energy Development Impact Office, 1982.
102. "A Guide to Selecting Landscape Plants for Wisconsin", E.R. Hasselkas, U.W. Extension, Madison, 1982.
103. "Riparian and Floodplain Ecosystems: Functions, Values, and Management", Fish and Wildlife Service, Eastern Land Use Team, by Mark M. Brinson, April 1980.
104. "The Impacts of Sand and Gravel Dredging on Trout and Trout Habitat in the Chattahoochee River, Georgia", Christopher R. Martin, and Timmy B. Hess, Georgia Department of Natural

Resources, Game and Fish Division, Atlanta, Georgia, 1986.

105. "Impacts of Gravel Mining on the Habitat and Fish Community of the Big Rib River", Paul Kanehl, and John Lyons, Wisconsin Department of Natural Resources, Madison, Wisconsin, 1987.
106. "Sand and Gravel Pits as Fish and Wildlife Habitat in the Southwest", William J. Matter, and R. William Mannan, United States Department of the Interior, Fish and Wildlife Service / Resource Publication 171, 1988.